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TWENTY-EIGHTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

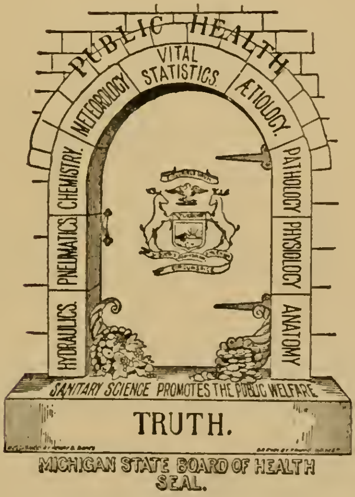
STATE BOARD OF HEALTH

OF THE

STATE OF MICHIGAN

FOR THE

FISCAL YEAR ENDING JUNE 30, 1900



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Office of the
Secretary of the State Board of Health,
Lansing, Michigan, *December*, *1900*.

To Hon. Hazen S. Pingree, *Governor of Michigan:*

Sir—In compliance with the laws of this State, I present to you the accompanying report for the fiscal year ending June 30, 1900.

Very respectfully,

HENRY B. BAKER,

Secretary of the State Board of Health.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no paper shall be published in the annual report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CONTENTS.

PART I.

Page.
Title page ... i
Letter of transmittal to the Governor of Michigan ... iii
Resolution relative to papers in the annual report ... iii
Contents ... iv
Introductory statements ... v–vii
Work of the Board, fiscal year 1900 ... vii–xi
Regular and special meetings of State Board of Health ... xi–xii
General report of the work in the office of the secretary, fiscal year 1900 ... xii–xx
Report of the secretary relative to property, etc., fiscal year 1900 ... xx–xxii
Amount and classification of expenditures, fiscal year 1900 ... xxiii
Expenditures on account of the Board ... xxiii
Abstracts from the quarterly reports of work in the office of the secretary during fiscal year ... xxiv–xxvii

PART II.

Principal meteorological conditions in Michigan in 1899 ... 1–57
Time of greatest prevalence of each disease in Michigan in 1899 ... 58–104
Communicable diseases in Michigan in 1899 ... 105–109
Diphtheria in Michigan in 1899 ... 110–122
Scarlet fever in Michigan in 1899 ... 123–142
Rötheln (German measles) in Michigan in 1899 ... 143
Typhoid fever in Michigan in 1899 ... 144–167
Typhoid fever among Michigan volunteers in 1898 and its relation to typhoid fever in 1898 and 1899 ... 167
Measles in Michigan in 1899 ... 168–180
Whooping-cough in Michigan in 1899 ... 181–189
Smallpox in Michigan in 1899 ... 190–199
Chicken-pox (varicella) in Michigan in 1899 ... 199
Vaccination in Michigan ... 200
Consumption in Michigan in 1899 ... 201–218
Pneumonia in Michigan in 1899 ... 219
Meningitis in Michigan in 1899 ... 220–242
Cancer ... 242–255
Erysipelas ... 243
Puerperal fever in Michigan in 1899 ... 243
Animals' diseases dangerous to man ... 244
Tuberculosis in cattle in Michigan in 1899 ... 244–245
Milk inspection, and tuberculin testing of dairy cows ... 245–246
Glanders in Michigan in 1899 ... 246–247
Actinomycosis (lump-jaw) in Michigan in 1899 ... 247
Alleged rabies in Michigan in 1899 ... 247
Hog colera believed to have affected children ... 247–248
Suspected meat poisoning ... 248
Alleged cascaret poisoning ... 249
Casualties from use of kerosene in Michigan in 1899 ... 250–253
Casualties from use of gasoline in Michigan in 1899 ... 253
Alleged nuisances in Michigan in 1899 ... 254

REPORT.

PART I.

INTRODUCTORY, GENERAL STATEMENTS.

This is the Twenty-eighth Annual Report of the Secretary of the State Board of Health, and is for the fiscal year ending June 30, 1900. It is arranged in two parts.

The first part contains the Secretary's Report of Work of the Board; General Report of Work in the Office of the Secretary of the Board; Abstracts from the Quarterly Reports of Work in the Office of the Secretary, and of the Condition of Health During the Fiscal Year ending June 30, 1900; Report of the Secretary Relative to Property for the Fiscal Year Ending June 30, 1900, and Financial Statements for the Fiscal Year.

The second part contains abstracts and reports, including a report on the "Principal Meteorological Conditions in Michigan in 1899," one on the "Time of Greatest Prevalence of Each Disease," being a "Study of the Causes of Sickness in Michigan," especially in 1899, one on the "Communicable Diseases in Michigan in 1899," Diphtheria, Scarlet Fever, Rötheln, Typhoid Fever, Measles, Whooping-cough, Smallpox, Chicken-pox, Vaccination, Consumption, Pneumonia, and other communicable diseases, including Tuberculosis in Cattle, Puerperal Fever, Rabies, Infectious Diseases among Hogs, and Actinomycosis. The second part also includes several miscellaneous articles, important among which are those pertaining to loss of life and property alleged to have been caused through the use of Kerosene and Gasoline, "Alleged Nuisances," and "What is a Reasonable Compensation of a Health Officer?"

Annual report required by law.—Much of the work of the State Board of Health, and of its secretary and executive officer, is in the collection, preparation, and spreading of information useful for the restriction and prevention of diseases, and the methods of work are dealt with further on in this report; but, under the law the Secretary of the Board is specifically required to disseminate information "through an annual report, and otherwise;" pursuant to which, by direction of the Board, he issues immediately after the close of each week, a bulletin, which shows the diseases which caused most sickness during the week just passed; also a monthly bulletin, showing the relative importance of diseases during the month, and sometimes a quarterly bulletin is published containing the proceedings of the Board, the report of work in the office of the secretary, and the condition of health during the quarter. The proceedings of sanitary conventions are published as soon as practicable after the occurrence of each convention.

Since April, 1898, a monthly publication, entitled "Teachers' Sanitary Bulletin" has been issued by the Board to supply to the many thousands of teachers in the public schools in Michigan suggestions to enable them better and more completely to comply with the law which requires "That there shall be taught in every year in every public school in Michigan the principal modes by which each of the dangerous communicable diseases is spread and the best methods for the restriction and prevention of each such disease."

Sanitary information published ephemerally.—The secretary also disseminates information by means of the telegraph, the telephone, by letter, and especially by means of hectographed and neostyled statements prepared and distributed to members of the Board, to others interested in public-health work, and to newspapers in Michigan. Thus items of sanitary interest which are considered as useful "news" are published at once in comparatively ephemeral bulletins, etc., while the annual report is issued as a permanent official record of the work of the State Board of Health, of the office of the secretary, and of local boards of health throughout the State. The annual report is not designed to serve as news; that purpose is served by other modes of publication previously mentioned; it contains statistics which require a great deal of painstaking care in their preparation, and which it is hoped will be useful, *for all time to come*, to those wishing to study the causation of diseases and, through their labors, to the people of this State and of the world. The statistics being preserved in a permanent form are accessible for study by a comparatively large number of persons.

The law relative to the preparation of this annual report.—Act No. 44, Laws of 1899, is the general law which governs the printing and distribution of the various State publications, including the annual report of the State Board of Health. By that law this report is limited to 300 pages. While the report is less than half its former size, the work of preparing it has been increased, because the volume should contain about the same data as before, only in a more condensed form. By the present law the publication of the annual report is not necessarily hastened, because *there is no requirement that the State Printer shall complete the work in a specified time;* but it is necessary that the "copy" for an annual report must be completed by the officer making it and in the hands of the Board of State Auditors by December 1 of the year for which the report is made. This precludes the publication of the statistics of the Board for the same year for which the report is made; of necessity they must be for the previous year; and even then it requires rapid work to compile and condense the data in the time required by the law; because the returns from health officers and others on which the statistical portion of the report is based are slow in coming in, and it is sometimes several months after the close of a year before the work of compilation can be commenced.

Names and addresses of members of the Board.—The names and postoffice addresses of members of the State Board of Health, and the dates of the expiration of their terms of office, are as follows:

DELOS FALL, M. S., ALBION, January 31, 1901.
HON. AARON V. McALVAY, MANISTEE, January 31, 1901.
FRED R. BELKNAP, M. D., NILES, January 31, 1903.
HON. FRANK WELLS, *President of the Board*, LANSING, January 31, 1903.
COLLINS H. JOHNSTON, M. D., GRAND RAPIDS, January 31, 1905.
D. A. MacLACHLAN, M. D., DETROIT, January 31, 1905.
HENRY B. BAKER, M. D., *Secretary of the Board*, LANSING.

The members of the State Board of Health, with the exception of the secretary, are appointed for the term of six years, and receive no salary or per diem compensation for their services.

Standing committees of the State Board of Health.—Notwithstanding the assignment to committees of the duty of investigation in certain lines of work, each member is free to present any facts or views on any subject relative to or having any bearing upon the public health.

The committees as rearranged and adopted by the Board, September 30, 1893, and the members appointed on committees by President Frank Wells, January, 1898, and October, 1900, are as follows:

1. Epidemic, endemic and communicable diseases, Fred R. Belknap, M. D.
2. Sewerage and the disposal of excreta, Collins H. Johnston, M. D.
3. Water supply, including purification of sewage-contaminated water, Prof. Delos Fall.
4. Buildings, including house drainage, ventilation, heating, etc., D. A. MacLachlan, M. D.
5. Climate, geology, topography and drainage, Henry B. Baker, M. D.
6. Foods, drinks and their adulteration, Prof. Delos Fall.
7. Poisons, explosives, etc., Prof. Delos Fall.
8. School hygiene and sanitation, D. A. MacLachlan, M. D.
9. Sanitary inspections in cities and villages, Hon. Aaron V. McAlvay.
10. Statistics of mortality and sickness, Henry B. Baker, M. D.
11. Public health legislation, Aaron V. McAlvay.
12. Finances of the Board, Hon. Frank Wells.
13. Animals' diseases dangerous to man, Collins H. Johnston, M. D.
14. Relations of preventable sickness to taxation, Fred R. Belknap, M. D.
15. Quarantine at the Michigan border and within the State, Hon. Frank Wells.

WORK OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1900.

Aside from the work in committees and in connection with the office of the Secretary of the Board, the work of the State Board of Health itself has included that done at sanitary conventions, at an important conference of health officials, at farmers' institutes, besides that in connection with the examination of plans and specifications for proposed public buildings, and the work done at regular and special meetings of the Board.

Sanitary conventions.—During the year ending June 30, 1900, there have been two important sanitary conventions such as have previously been held, and one extraordinary convention participated in by the health officials throughout this State, and by several from without the State. This last-mentioned will be mentioned in the paragraph following this one. One convention occurred at Traverse City, August 22 and 23, 1899, and the other at Alma, June 7 and 8, 1900. At these conventions as at others of the kind, held from time to time under the direction of the State Board of Health, the subject of greatest moment to the particular locality was the central theme, and the heaviest stress laid upon it in the papers and discussions, although the general educational work of the board, the modern principles of public sanitation and the best ideas in public health work are brought out. Such conventions are usually attended by those persons in the locality or neighborhood most largely interested in good sanitary conditions, improved public health and the sanitary welfare of the locality. They are frequently largely attended by neighboring health officers and others directly interested in public health work. The proceedings of the sanitary convention at Traverse City are printed in pamphlet form [Reprint No. 549], but for lack of means the proceedings of the convention at Alma are not printed.

Sanitary convention.—Conference of health officials.—The Fourth General Conference of Health Officials in Michigan was held in Grand Rapids, October 26 and 27, 1899, and to those persons interested in the public health it was a gathering of great importance. The State Board of Health, because of insufficient appropriations, has not at all times been able to hold such meetings of health officials, and when it is possible to do so, many subjects of vital import must necessarily be discussed and the discussions limited to small space. At this conference the subjects to which particular attention was given were: Bacteriology in its Relations to Public Health; Sewerage and Water Supply; Water Purification; Typhoid Fever; Tuberculosis Among Animals and in Man; Local and General Health Administration; and The Duties and Powers of Local Boards of Health. The discussions cannot fail to prove valuable and interesting to any person who places an adequate estimate upon the value of human life, and especially to those in whose care public health interests are entrusted, i. e., the health officers. Papers were read and discussed by persons best fitted to offer suggestions upon the various topics assigned to them and the program contains names which represent the best thought on many of the important questions of public sanitation. Bacteriologists, practical sanitarians, statisticians, active medical practitioners and business men all combined to make this conference one of paramount importance and value.

The conference was attended by many of the most efficient and conscientious local health officers and municipal bacteriologists, by the members of the State Board of Health, by prominent sanitary engineers and prominent sanitarians from other states, and by such of the general public as chose to attend. The proceedings of the convention are published in pamphlet form [Reprint No. 559], copies of which may be obtained at the office of the State Board of Health, and will be sent on request.

Farmers' institutes.—Through the courtesy of the officers in charge of the farmers' institutes, held under the auspices of the State Board of Agriculture, members of the State Board of Health have attended farmers' institutes held in various portions of the State, and have read papers or talked to the people on subjects relating to good health, including the restriction and prevention of the dangerous communicable diseases.

Examination of plans for State buildings,—sewerage, ventilation and heating,—during the fiscal year ending June 30, 1900.—Act No. 206, Laws of 1881 (Sec. 2229, Compiled Laws of 1897; Sec. 15, Public Health Laws 1899), as amended by Act No. 86, Laws of 1889, and Act No. 58, Laws of 1897, is as follows:

"Sec. 7. That before the board of any charitable, penal, educational or reformatory institution shall determine on the plan of any building, or on any system of sewerage, ventilation or heating, which has been authorized by the legislature to be constructed, such plan shall be submitted to the Board of Corrections and Charities and the State Board of Health for examination and opinion thereon; and the board so submitting such plan shall, in its biennial report, show to what extent it was approved by the boards so examining them. And no money shall be paid out of the State treasury for the execution of any such plan or system until the Board of Corrections and Charities shall file with the Auditor General a written opinion that the proposed plan is of such character that the construction may be fully completed in accordance therewith at an expense within the amount appropriated therefor. That it shall be the duty of said State boards to visit said penal, educational, charitable and reformatory institutions when necessary to make the examination herein required, and their expenses necessarily incurred shall be audited by the Board of State Auditors and paid from the general fund."

Since the report of this Board for 1898, in which the last detailed article on this subject will be found printed (pages xii-xxvii) there has not been an attempt to report the Board's action in the examination of plans and specifications for proposed new State buildings. It has been necessary to omit the report of this important function of the Board on account of the general law which governs the printing and distribution of various State publications, Act No. 44, Laws of 1899, which limits the report to three hundred pages. The examination of plans for new State buildings has been particularly onerous during the fiscal year 1900, and it has seemed desirable to give a list of the State institutions for which plans were examined either with a view to the construction of new buildings, additions to be made to already constructed buildings, or the examination of sites upon which new buildings are to be erected.

An important movement in connection with the examination of plans by the State Board of Health has been effected through the prompt, courteous coöperation of the State Board of Corrections and Charities. Under the present law the State Board of Corrections and Charities is required to examine plans for the purpose of ascertaining whether or not the buildings, for which the plans are designed, can be built for the appropriation made by the legislature; and after that Board certifies that it can be accomplished, the board of control of the institution for which the plans are designed can draw the money with which to construct the building, no matter whether the plans are such as can be approved by the State Board of Health or not; and if proper provision for fresh air is omitted, the building can be made larger by the amount taken away from the cost of providing fresh air to the building. Prior to the arrangement which will be mentioned below, it had become plain to the State Board of Health that there is sometimes left out of the plans proper provision for the supply of fresh air to the inmates of State institutions; in one instance, that of a hospital, the provision for fresh air for the inmates had been omitted on the ground that the appropriation made for the building was insufficient and that the provision for supplying fresh air could be provided at some future time. One hospital visited by the State Board of Health which was planned by the same architect, was without provision for a fresh air supply, and the building was even then in use as a hospital. In view of this state of facts a committee was appointed to meet with the State Board of Corrections and Charities to urge that some arrangement be made so that hereafter all plans shall be first examined by the State Board of Health. By this means it will enable the State Board of Corrections and Charities to judge whether buildings can be constructed within the appropriation in accordance *with proper sanitary requirements.* As a result of almost simultaneous action on the part of the two Boards, a conference between the committee appointed on the part of the State Board of Health, and the State Board of Corrections and Charities was held on October 13, 1899, for the purpose of discussing the matter; and although no formal action was taken it was understood between the two Boards that there should be entire coöperation in the examination of plans and specifications for State buildings and that it would be practicable for the State Board of Health to first examine the plans that the Board of Corrections and Charities might the more easily and certainly ascertain whether or not buildings could be properly constructed and have the proper ventilating system within the appropriation allowed.

The following is a list of the buildings for which plans and specifications were examined during the fiscal year 1900.

Pontiac, August 17, 1899.—Proposed new building for men and proposed new building for women, at Eastern Michigan Asylum. Changes in method of fresh air inlet, foul-air outlet and dust shutes suggested.

Lapeer, August 17, 1899.—Proposed new heating plant for Michigan Home for Feeble-Minded and Epileptic. Site and proposed plans approved.

Traverse City, August 21, 1899.—Two proposed new cottages at the Northern Michigan Asylum for Insane. Suggestions for inlet of fresh air, approved.

Flint, August 28, 1899.—Proposed new school building at Michigan School for Deaf. Material changes suggested in the system of ventilation and heating.

Kalamazoo, August 29, 1899.—Proposed new cottage for men at the Michigan Asylum for Insane. Suggestions as to removal of vitiated air.

Grand Rapids, August 30, 1899.—Proposed new addition to the hospital at the Michigan Soldiers' Home. The means of fresh air supply to several of the rooms not shown, and foul-air exit from several rooms not shown. It was suggested that deficiencies be supplied. The system of sewerage and exit of foul air was not sufficiently definite. Suggestions for same made.

Lansing, September 1, 1899.—Proposed new hospital at the Michigan School for the Blind. Suggestions as to ventilation and sewerage made.

Lansing, September 1, 1899.—Proposed new woman's building at the Michigan State Agricultural College. Suggestions for slight change in the radiation, disposal of foul air and sewerage, the plans generally approved and commended.

Meeting at Lansing, September 1, 1899.—Proposed new barn at the State Public School, Coldwater. Additional ventilation and sewerage suggested.

Lansing, September 1, 1899.—Proposed new workshop at State Industrial School for Boys, Lansing. Provision for supply of fresh air inlet and foul air outlet not shown on plans. Suggestions for same made, also for additional drainage.

Meeting at Lansing, October 13, 1899.—New State Normal School at Marquette. Changes in heating and ventilation suggested.

Adrian, November 14, 1899.—Extension of the steam heating system from the central plant to the administration and hospital buildings, at State Industrial Home for Girls, Adrian. Change in plan of heating and ventilation suggested.

Grand Rapids, January 30, 1900.—Proposed new power house and chimney at the Michigan Soldiers' Home, Grand Rapids. Changes in ventilation, heating and sewerage suggested.

Meeting at Lapeer, March 7, 1900.—Proposed additions to the State Normal School at Mt. Pleasant. Suggestions for change in heating, ventilation and sewerage, and lighting in one room.

Lapeer, March 7, 1900.—Proposed new custodial building for the Michigan Home for Feeble Minded and Epileptic, Lapeer. Generally approved.

Meeting at Lapeer, March 7, 1900.—Proposed new cottages "P" and "Q" for the Upper Peninsula Hospital for Insane, Newberry. Suggestions for additional ventilation, otherwise approved and generally commended.

Meeting at Lapeer, March 7, 1900.—Proposed new farm barn for the Michigan Agricultural College. Change in ventilation and minor change as to sewerage suggested.

Lansing, May 4, 1900.—Proposed new dairy building at Michigan Agricultural College. Suggestions for slight change, generally approved.

Meeting at Lansing, May 4.—Proposed new farm house and new farm barn for the Upper Peninsula Experiment Station, Chatham, Alger county. Small details suggested by way of improvement.

Meeting at Lansing, May 4, 1900.—Proposed "New Heating Plant" for the main buildings, school building, hospital, and nine cottages, at the State Public School at Coldwater. The appropriation is designed to provide for a heating plant and proper ventilating cannot be done thereunder. Proper ventilation desirable as soon as possible.

REGULAR AND SPECIAL MEETINGS OF THE STATE BOARD OF HEALTH, DURING THE FISCAL YEAR ENDING JUNE 30, 1900.

The minutes of the regular and special meetings of the Board up to and including the meeting October 23, 1888, were copied into the permanent record books in the office of the secretary. From that time and including the proceedings of the meeting May 13, 1898, the minutes have been printed in the annual reports of the Board. The annual report for 1898 is the last one in which the proceedings of the meetings of the Board are printed in full. Commencing with the annual report for 1899 the new law of 1899 took effect, and the volume was greatly reduced in size, being limited to 300 pages. Accordingly mention only may be made of the times and places of meetings and members present at each of the regular and special meetings during the fiscal year ending with June 30, 1900.

Regular meeting, Lansing, July 14-15, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Hon. Aaron V. McAlvay, Doctor Fred R. Belknap, Doctor D. A. MacLachlan, and Doctor Henry B. Baker, secretary.

Special meeting, Pontiac, August 17, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Hon. Aaron V. McAlvay, Doctor Collins H. Johnston, Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

Special meeting, Traverse City, August 21-22, 1899.—The members present were: Hon. Frank Wells, president; Doctor Collins H. Johnston, and Doctor Henry B. Baker, secretary, who were at the meeting of August 21. On the 22d, the following members arrived: Prof. Delos Fall, Doctor Fred R. Belknap, Judge Aaron V. McAlvay, and Doctor D. A. MacLachlan.

Special meeting, Flint, August 28-29, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

Special meeting, Lapeer, August 29, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall. Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

Special meeting, Kalamazoo, August 30, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall. Doctor Fred R. Belknap, Doctor Collins H. Johnston, and Doctor Henry B. Baker, secretary.

Special meeting, Grand Rapids, August 30, 1899.—The members present were: Hon. Frank Wells, president; Doctor Fred R. Belknap, Doctor Collins H. Johnston, and Doctor Henry B. Baker, secretary.

Special meeting, Lansing, September 1, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

Special meeting, Lansing, October 13, 1899.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

Special meeting, Grand Rapids, October 26, 1899.—The members present were: Hon. Frank Wells, president; Doctor Fred R. Belknap, Hon. Aaron V. McAlvay, Doctor D. A. MacLachlan, Doctor Collins H. Johnston, and Doctor Henry B. Baker, secretary.

Special meeting, Adrian, November 14, 1899.—The only member present was Doctor Henry B. Baker, secretary. November 18, 1899, a report of the examination of plans November 14, 1899, was issued "by direction of the State Board of Health."

Regular meeting, Lansing, January 12, 1900.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Hon. Aaron V. McAlvay, Doctor D. A. MacLachlan, Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

Special meeting, Lapeer, March 7, 1900.—The only member present was Doctor Henry B. Baker, secretary. The action taken was afterwards approved by a majority of the members of the Board.

Regular meeting, Lansing, April 13, 1900.—No quorum being present, the meeting was adjourned to meet in Lansing, April 20, 1900.

Adjourned regular meeting, Lansing, April 20, 1900.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Hon. Aaron V. McAlvay, Doctor Fred R. Belknap, Doctor D. A. MacLachlan, and Doctor Henry B. Baker, secretary.

Special meeting, Alma, June 7, 1900.—The members present were: Hon. Frank Wells, president; Prof. Delos Fall, Doctor Fred R. Belknap, and Doctor Henry B. Baker, secretary.

GENERAL WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1900.

Much of the work of the office naturally groups itself under three heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping is adhered to so far as is practicable without repetition.

COLLECTION AND COMPILATION OF INFORMATION.

Return of names and postoffice addresses of health officers.—There is a local board of health in every township, and in every incorporated city and village in Michigan.

Every local board of health in Michigan is required by law to appoint and constantly have a health officer, and to report his name and address to the Secretary of the State Board of Health at Lansing.

Blanks for the return of the names and addresses of health officers are sent out by the Secretary of the State Board to the local health officers about the first day of April, the law (Sec. 4411, C. L. 1897; Sec. 46, P. H. L. 1899) requiring the appointment and return to be made "within thirty days after the annual township meeting in each year."

In April, 1900, the usual demand was made upon supervisors of townships, presidents and clerks of villages, and mayors and clerks of cities, for the return of names and postoffice addresses of health officers to serve in 1900-1901. The circular and blank forms are similar to those printed on pages xiii-xiv of the report of this Board for 1884. In June, 1900, a second demand was sent to localities from which no return had been made in response to the demand in April. On the outbreak of a dangerous communicable disease in a township, city or village, in which no health officer had been reported, a third and even a fourth demand for the appointment of such officer, and the return of his name has been made; therefore, the number of health officers returned increases until the close of the year for which such officers are appointed. At the close of the fiscal year ending June 30, 1900, the numbers of health officers in townships, cities and villages were as follows: Townships, 1,206; cities, 78; villages, 305.

Through the systems of reports to the State Board of Health by its corps of correspondents, as well as by the local health officers, by the systematic searching of the local columns of country newspapers published in Michigan, and by a diligent search of the reports of deaths to the Division of Vital Statistics in the office of the Secretary of State, the Secretary of the State Board of Health often receives information of an outbreak of a communicable disease and desires to communicate at once with the local health officer; but if no health officer has been appointed in that locality, or no return of such appointment has been made, delay occurs, and before the secretary is able to establish authentic communication with the local board of health, and a health officer can be chosen, the disease may spread widely within or without the limits of a village or a township, with unnecessary sickness and loss of life. It should be said, however, that there is an increasing tendency to comply with this law, and local boards now generally act promptly and coöperate cordially with the State Board of Health in its endeavors to prevent the spread of dangerous communicable diseases.

Special reports relative to dangerous communicable diseases.—Every health officer is supplied with blanks "L" from this office, for reporting outbreaks of diphtheria, scarlet fever, typhoid fever, smallpox, measles, etc. (dangerous communicable diseases), to the Secretary of the State Board as required by law. A special blank [S.] for reporting outbreaks of consumption is also supplied local health officers.

Upon the receipt of the report of an outbreak of such disease, blanks [M.] for weekly reports so long as the outbreak lasts, are sent, with a circular letter ("Blue Letter"), also a number of pamphlets containing instructions for the suppression of the disease. These pamphlets are to be distributed to the neighbors of the family in which the disease is, in order to educate them to the importance of their duty under the law, and to secure their coöperation with the health officer.

About 5,306 outbreaks of such diseases were thus attended to during the fiscal year.

Later, a blank is sent to the health officer of each jurisdiction for a final report at the close of the outbreak, stating just what was done for the restriction of the disease, and with what result—the number of cases and deaths, households invaded, what disinfections were used, what exceptions, and other facts supplying data for guidance of future efforts.

The facts thus collected are compiled for publication in the annual report of the Secretary of the State Board of Health. In this annual report will be found the report of the facts relative to the dangerous communicable diseases in Michigan in the year 1899.

Annual reports by health officers for the year ending December 31, 1900.—In January, 1900, a circular [218] was sent to the health officer of each township, city and village in the State, about 1,589 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular [65] which is printed on pages viii-ix of the report for 1884. Blank form [I] for reports of health officers is printed in former reports. With the circular [218] was also transmitted a blank for a copy of a record of diseases dangerous to the public health, similar to the blank which is printed on page 271 of the report for 1882.

Where the name of the health officer has not been returned the blanks were sent to the president of the village, the mayor of the city, or the supervisor of the township, according as the vacancy occurred in a village, city or township.

In case this failed to secure the return in accordance with the State law, the aid of the prosecuting attorney was requested. This has had the effect of securing a more complete return of reports of health officers.

Annual reports by clerks of local boards of health discontinued.—Since the change of the law (Secs. 4452 and 4453, Compiled Laws 1897; Secs. 87 and 88, Public Health Laws 1899), went into effect, reports of cases of "diseases dangerous to the public health" are not made by the clerk; and, unless it has been impracticable to secure a satisfactory report from the health officer, no demand was made upon the clerk for an annual report.

Return of names of medical practitioners discontinued.—Section 3, Act No. 167, Laws of 1883, as amended by Act No. 268, Laws of 1887 (Sec. 5281, Compiled Laws 1897), provides that:

> "It shall be the duty of the supervisor, at the time of making the annual assessment in each year, to make out a list of all the physicians and each student practicing under the instruction of a preceptor residing within his township, village, ward, or city, with the name, age, sex and color of each, and the length of time each has been engaged in practice, and if a graduate of a regularly established and reputable college, the name of the college and the date of graduation. Such list shall be returned by the supervisor to the township, village or city clerk, and by the clerk recorded in the book in which are kept the records of the local board of health, and annually on or before the first day of January such clerks shall furnish certified lists of the same to the Secretary of the State Board of Health."

The State Board of Health has regularly, about April 1 in each year, sent blanks for the return of names of medical practitioners to supervisors in Michigan to make it convenient for them to comply with the law. At the close of the year there were sent to the clerks of all townships, cities and villages, blanks on which to report to the State Board of Health the list of physicians returned by the supervisors. Notwithstanding this effort, the returns have never been complete, in fact they were so incomplete that in 1896 the effort to collect these lists was abandoned.

The change in the law requiring all dangerous diseases to be reported to the health officer was another reason for discontinuing the effort to secure from clerks the return of the names of medical practitioners.

Meteorological reports.—A list of meteorological observers for the calendar year 1899, with a statement of what registers were received from each, is printed in this report. The reports are summarized in an article in this report on "The Principal Meteorological Conditions in Michigan in 1899," commencing on page one of Part II. The data are of great value for the purpose of studying the causes of diseases. The observations made at the office of the Board at Lansing have been summarized weekly, and a copy placed on file in the office.

The compilation of laws relating to the public health in Michigan including the laws of 1899.—During the year 1900 the third compilation of laws relating to public health was made. Preceding compilations had been made for the years 1883 and 1890 respectively, each bringing public health enactments up to the date of its publication. The compilation of the health laws for 1899 includes all the enactments of the legislature from the time of the organization of this Board to the time of publishing the pamphlet, together with references to Howell's Annotated Statutes, the Compiled Laws of 1897, and a citation of cases which have been decided upon the various statutes compiled.

DISSEMINATION OF INFORMATION.

Published list of names and addresses of health officers.—The names and addresses of 1,589 health officers in Michigan, to serve in 1900-1901, were collected and recorded in the office, and a list will probably be printed in pamphlet form.

Distribution of information how to restrict and prevent dangerous communicable diseases.—Whenever information was received of the first occurrence of diphtheria, scarlet fever, typhoid fever or typho-malarial fever, measles, whooping-cough, consumption, smallpox or cerebrospinal meningitis, copies of a document on the restriction and prevention of the disease reported were immediately sent to the health officer with a request that he distribute them where they will be most likely to be read, and it was suggested that the neighbors of those families in which the sickness occurs would be most likely to read them at such times of danger, and it was thought that after reading them they will be most likely to coöperate with the local health officer for the restriction of the disease. Thousands of pamphlets on the most dangerous communicable diseases are distributed by the State Board of Health in this manner, in localities where the disease treated of in the pamphlet is present. They are being distributed in this way all the time, because there is no time when the State is free from consumption, scarlet fever and diphtheria, these being the most important of the dangerous communicable diseases in Michigan. Copies of the documents on diphtheria, scarlet fever and smallpox, in German or in Dutch, are also sent when it is thought they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish and Danish Norwegian, translations of a leaflet [47] on contagious diseases have been made into each of these languages, and copies sent to local boards of health when requested.

A record is kept of reports received, and of correspondence relative to each outbreak of a dangerous communicable disease of which the office receives information. A compilation of such information relative to the most important diseases is published in this volume.

Printing and distribution of the secretary's annual report.—Comparatively few copies of the annual report of the secretary are published; the whole number is not so large as the number of officers and members of local boards of health in Michigan. In accordance with the provisions of Section 10, Act No. 44, Laws of 1899 (Sec. 14, Public Health Laws 1899), only 4,000 copies of the annual report are published, 2,000 copies less than have ordinarily been published, but about the same number of copies is allowed for distribution by the Secretary of the State Board of Health (about 3,800). Prior to the passage of Act No. 44, Laws of 1899, many of the reports were practically wasted, being sent to county clerks, from whose offices they were taken only as waste paper. Under the present act, however, it is believed that the reports will be placed to more advantage, and, although it is believed that there is not a sufficient number of copies for distribution by the Secretary of the Board, still it is true that for the number published, they will be more advantageously distributed. These reports are used in exchange with sanitary journals, with other State Boards of Health, with city boards of health in other States, and with health officials in other countries, with libraries, and are sent to physicians in Michigan who contribute to the work of the State Board, and to persons who request copies of the report. Michigan is a populous and prosperous State, largely because of the healthful conditions here, and it is believed that it is made richer, not poorer, by the influence exerted by the publications of the Michigan State Board of Health.

Instructions to newly appointed health officers.—As fast as the names and addresses of health officers to serve in 1900-1901 were received, a copy of the Bulletin* [120] detailing the duties of health officers, was sent to each one who had not served during the preceding year, together with blanks "L" and "M" for the prompt report of any dangerous communicable diseases, and sample copies of pamphlets on the restriction and prevention of diphtheria, scarlet fever, typhoid fever, measles, whooping-cough, and consumption; also a slip (224) relative to consumption being a dangerous communicable disease, and a short statement relative to its restriction and prevention; a leaflet (226) on the modes of spreading and the best methods for the Restriction and Prevention of Dangerous Communicable Diseases; several leaflet diagrams exhibiting the experience in Michigan, showing the results for recent years in the restriction of diphtheria, scarlet fever, typhoid fever, measles and consumption, and two diagrams showing a comparison between the numbers of deaths from typhoid fever in sewered and unsewered localities, were sent to the newly appointed health officer. The pamphlet compilation of laws relative to public health which, although printed by direction of the Secretary of State, was compiled by a clerk in this office, and was sent out as directed by this office. About 1,589 copies were sent to health officers whose terms extended into the time when the pamphlet was published, and all the health officers for 1900-1901 were supplied with the compilation.

Teachers' Sanitary Bulletin.—During the fiscal year 1900, and since April, 1898, this Board has been issuing monthly a Teachers' Sanitary

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* Published under Sec. 15, Act 44, Laws of 1899.

Bulletin. At the time it was started, Mr. Theodore R. MacClure was chief clerk in the office of the Secretary of the State Board of Health, and it was at his suggestion to the secretary and to the Board, and by his aid that the preparation of the Bulletins was undertaken by the Board after the proposal had been reported on favorably by a committee. It has proved a very successful undertaking, and by educating the teachers and others of the State it is fair to presume that the bulletins have been the indirect means of saving many valuable lives. The Bulletins contain articles bearing on the restriction and prevention of the different dangerous communicable diseases, and are designed to aid the teachers of the State in instructing their pupils regarding these diseases, how they are spread, and how restricted. Act 146, Laws of 1895, requires these subjects to be taught every year, in every public school throughout the State. In addition to the leaflet especially designed to supply to teachers the "Data and Statements" which enable them to comply with the law, these Bulletins are the means by which information relative to the restriction and prevention of the different dangerous communicable diseases is brought to the attention of the teachers and by them to the people of the State. The Bulletins are sent to every teacher in the State, whose address can be procured, and the State Board of Health desires to have the name and postoffice address of every teacher in Michigan, to make it possible to send to them the "Data and Statements" which the State Board of Health is required to supply in order to enable teachers to comply with Act 146, Laws of 1895. Information regarding the name and address of a teacher who does not receive these Bulletins will be thankfully received. If the address of any teacher is changed, it will facilitate this branch of work in the office of the secretary if immediate notice of such change is sent to the Secretary of the State Board of Health, Lansing, Michigan.

Reprints.—Reprints of articles in the report and in proceedings of sanitary conventions, have been made in pamphlet form, and sent in answer to queries in letters that can be best answered in that manner.

Instructions to local health officers by telephone, telegraph, etc.—There are in Michigan about 4,500 officers of local boards of health (presidents, clerks, and health officers), many of whom are newly appointed each year, and coming to the work for the first time, need to ask many questions in order to be best prepared to serve the people in their several localities. As fast as such emergencies arise such questions are replied to by telephone, telegraph, letters, or otherwise as the occasion demands. This is one of the important functions of the central office, of the secretary and executive officer of the State Board.

Diagrams of instructive experience in Michigan.—Diagrams showing the favorable results of isolation and disinfection of diphtheria, scarlet fever, typhoid fever, smallpox, and the generally favorable results of isolation and disinfection, lives saved by public health work in Michigan, deaths from typhoid fever in sewered and unsewered localities and in cities before and after the introduction of sewerage, the relation of low water in wells and the deaths from typhoid fever have been printed and largely distributed. The evidence relative to the effect of isolation and disinfection as a preventive of the dangerous communicable diseases, gains strength as shown by the diagrams for each succeeding year compared with periods of years. The diagrams prove that in those localities in which isolation and disinfection of diphtheria and scarlet fever were enforced, only about one-fifth as many deaths occur as in those localities where isolation and disinfection are neglected. The diagrams relative to the other diseases show a greater or less proportion of life-saving through isolation and disinfection.

Pamphlets and other publications of the office.—During previous years the secretary's annual report has contained a more detailed summary of the pamphlets, maps, and diagrams printed and distributed by the State Board of Health, but now it will be possible to briefly mention only the most important of them.

An instructive paper read by John W. Alvord, C. E., Chicago, Ill., at the Sanitary Convention at Traverse City, "A Year's Experience with Recent Sewage Disposal Process," was printed in pamphlet form [550].

The following diagrams were printed and distributed during the year: Isolation and disinfection restricted scarlet fever and diphtheria [922], Isolation and disinfection restricted typhoid fever [1026], Isolation and disinfection restricted measles [1027], Lives saved by public health work from scarlet fever and smallpox [939], Low water in wells and sickness from typhoid fever [1035], Showing deaths from typhoid fever in several sewered and unsewered cities [644], and deaths from typhoid fever before and after the introduction of sewerage in several cities [645], and a collection of diagrams relating to mortality statistics, sickness statistics, meteorological statistics and contagious disease statistics which were adapted to illustrate a paper, "General Health Administration," read by Doctor Henry B. Baker, at the Conference of Health Officials at Grand Rapids.

The seventh edition of the pamphlet [226], "Dangerous Communicable Diseases, how spread and how restricted" was printed and distributed.

The first edition of the pamphlet [273], "Advice for the Restriction and Prevention of Meningitis" was printed and distributed.

The pamphlet reprints from the annual report relative to scarlet fever [538], typhoid fever [539], diphtheria [537], consumption [544], measles [540], and whooping-cough [541], in Michigan in 1897, were printed and distributed, as well as the phamphlet reprints on Tuberculosis in Cattle [543], Nuisances [545], Accidents from the use of Kerosene [546], Principal Meteorological Conditions [535], and The Greatest Prevalence of each Disease [536], in Michigan in 1897, and the pamphlet reprint, Principal Meteorological Conditions in Michigan in 1898. All of which were sent to localities under circumstances which promised the most profitable results from their distribution.

The pamphlet, "The Work of Health Officers and Local Boards of Health" (120), was extensively revised in 1900, with reference to the new compilation of laws of the State of Michigan for 1897, and the pamphlet publication of the laws relative to public health subjects for 1899, and widely distributed to health officials and members of local boards of health.

Ten thousand of each of the following pamphlets were printed and have been largely distributed as occasion has demanded: Restriction and Prevention of Measles (171), Restriction and Prevention of Diphtheria (106), Restriction and Prevention of Whooping-cough (229), Restriction and Prevention of Typhoid Fever (124). Other small pamphlets, bulletins, circular letters and leaflets are being constantly sent from this office with the object of keeping newspapers, and persons interested in public health matters in touch with the conditions of public sanitation.

Data and statements supplied to school superintendents and teachers in compliance with act No. 146, laws of 1895.—During the fiscal year, 296,283 copies of Teachers' Sanitary Bulletins were distributed. The greater part of the bulletins included were Nos. 15 to 26 inclusive; but a small portion of this number consisted of sets of Nos. 1 to 15 which had been left over in the office from other distributions, and were sent to traveling libraries, public school libraries, health officers of cities and villages, newspapers, judges, and public men and whoever it was thought they would assist in spreading the information which the Board is collecting.

Immigrants possibly exposed to communicable diseases, destined to settle in Michigan.—During the year two notices were received from the U. S. Commissioner of Immigrants at Philadelphia that typhus fever and measles had occurred on board steamships arriving at that port, and giving the names and destinations of immigrants on board those steamships intending to settle in Michigan; two notices were received from the surgeons of the steamships Laurentian and Lake Superior, stating that measles had occurred on board the former, and scarlet fever on the latter, and that the cases had been landed at Dominion Quarantine, Grosse Isle; later, two such notices were received from the surgeons of the steamships Lake Superior and Parisian, stating that measles had occurred on board those vessels, and that the cases had been removed to the Dominion Quarantine at Grosse Isle. Copies of these notices, including the lists of the names of the immigrants, were promptly sent from this office to the health officers of the jurisdictions where the immigrants intended to settle.

The purpose of such action is to aid the local health officials in preventing outbreaks of dangerous communicable diseases, and as a matter of fact, this method of forewarning the localities where possibly infected immigrants are to settle, has been productive of good results, and in the recent years while these measures have been in use, very few outbreaks of disease have been traced to immigrants.

Publication of proceedings of meetings of the State Board of Health.—Abstracts and brief accounts of the proceedings of meetings of the State Board are prepared, hektographed or printed, and distributed as soon as practicable after each meeting. Abstracts of the minutes of meetings have in former years been printed in Part I of the secretary's annual report, but since the report for 1899, and possibly in the future, they will be omitted from the report on account of the restriction of the size of the volume; but a record will be kept on file in the office of the secretary. The distribution of these abstracts is not the same for all meetings, being to different classes of persons according to the nature of the contents, as the action of the Board or its deliberations may be appropriate. In some instances they are sent to sanitary and medical journals, in others to teachers, health officers and others, and frequently to the members of boards of control of the different State institutions.

Secretary's quarterly reports of work in the office.—At the close of each quarter, the secretary prepares a brief report of the work done in the office. This report is presented, and portions of it sometimes read at the next regular meeting; and, if the abstract of the proceedings of the meeting is printed, this report is printed in the same pamphlet. Because of lack of funds it has not been practicable to print the quarterly abstract of proceedings of meetings in this fiscal year.

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING JUNE 30, 1900.

To the President and Members of the Michigan State Board of Health:

Gentlemen—In compliance with Section 5 of Article II of the by-laws of this Board, the following report of the "Nature and amount of property belonging to the Board, which has been received, issued, expended, and destroyed since the last report, and of property remaining on hand, and also in whose care each item of property is entrusted," is respectfully submitted:

Preceding reports should enable one to learn the items of property on hand at the beginning of the fiscal year 1900. My last report is printed on pages xxviii-xxx of the annual report for 1899. Since last report, instruments and articles of a similar nature have been purchased as follows:

Photo-engraved plates purchased.

Five plates relating to Weekly Reports of Sickness in Michigan in 1897.
Fifteen plates relating to the Meteorological Conditions in Michigan in 1898.
Five plates relating to Weekly Reports of Sickness in 1898.
One plate—Deaths from Consumption by Periods of Age.
One plate—Rheumatism follows Bronchitis. Inflammation of Kidneys follows Rheumatism.
One plate—Intestinal Diseases, reverse of Rheumatism and Neuralgia.
One plate—Atmospheric Ozone and Sickness from Rheumatism.
One plate—Sickness from Bronchitis, Rheumatism, and Inflammation of Kidneys.
One plate—Isolation and Disinfection restricted Measles in Michigan in 1897.
One plate—Confluent Smallpox, 8th day.
One plate—Isolation and Disinfection restricted Typhoid Fever in Michigan, 9 years, 1890-98.
One plate—Isolation and Disinfection restricted Measles in Michigan, 9 years, 1890-98.
One plate—Isolation and Disinfection restricted Scarlet Fever in Michigan in 1898.
One plate—Isolation and Disinfection restricted Diphtheria in Michigan in 1898.
One plate—Low Water in Wells, and Sickness from Typhoid Fever in Michigan, 14 years, 1878 and 1880-92
One plate—Distribution of Consumption in Michigan in 1897.
One plate—Safe Drinking Fountain for Country Schools.
One plate—Distribution of Consumption in Michigan in 1898.

Property Loaned.

Many photo-engraved plates were loaned to Robert Smith Printing Co., State Printers and Binders, Lansing, to be used in printing annual reports and other publications of this Board. Most of these plates have been returned, but a few still remain charged to them on the property loan book of this office. The plates will probably be returned as soon as the State Printer is through with them.

Instruments purchased since last report.

Two skeins wicking for psychrometer.

Meteorological instruments issued.

One measuring stick for rain-gauge to J. H. Kellogg, M. D., Battle Creek.

One wet bulb thermometer (to replace one accidentally broken while in use) to E. S. Pettyjohn, M. D., Alma.

Meteorological instruments returned.

None returned.

Meteorological instruments accidentally broken while in use by observers.

One barometer, No. 2339, and box for protection, one dry-bulb thermometer, one wet-bulb thermometer, board, clips, cup, and wick, 1 rain-gauge, with measuring stick, 1 psychrometer cup, 1 galvanized iron pail, 1 maximum registering thermometer, 1 minimum registering thermometer. Dr. W. C. Gates' home was burned out, and these instruments destroyed. Letter from Dr. Gates, Rockland, Dec. 2, 1899.

One maximum self registering thermometer, by observer at Alma.

Meteorological instruments and other property on hand.

6 standard barometers (including one in use at this office).
8 dry-bulb thermometers (including one in use at this office).
8 wet-bulb thermometers (including one in use at this office).
3 minimum self-registering thermometers (including one in use at this office).
6 maximum self-registering thermometers (including one in use at this office).
1 standard thermometer.
1 standard thermometer for inspecting oils.
7 registering thermometer boards (including one in use at this office).
13 psychrometer boards (including one in use at this office).
2 psychrometer cups (including one in use at this office).
8 minimum thermometer clips.
6 psychrometer clips.
9 screw bolts for registering thermometers.
10 pins for registering thermometers.
3 hooks for hanging barometers.
5 barometer boxes.
1 rain-gauge in use at this office.
2 caps for overflow tubes.
1 large galvanized iron pail, to measure snowfall.
1 Draper's self-registering thermometer.
2 anemometers, for use in this office.
2 circular magnifying hand glasses.
3 psychrometer cups, spoiled by rust and long use.
9 psychrometer cups, injured by use, can be repaired.
33 broken thermometers (includes all, since observations have been taken).
1 worn-out anemometer spindle.
1 hard rubber triangle, 13 inch.
1 hard rubber triangle, 6 inch.
1 dotting instrument.
1 adjustable curve ruler.
1 parallel ruler, wood.
1020 ozone slips.
1 parallel ruler, hard rubber.

The following table showing the amount and kind of hard paper there was on hand at the time of making the last report, the amount purchased during the year ending June 30, 1900, the amount used, and the amount on hand at close of year:

Kind of paper.	On hand at last report.		Purchased since last report.		Used during the fiscal year.		On hand June 30, 1900.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Flat	4	280			1	434	2	326
Crown	1	165	6		2	40	5	125
Folio post	16	48	32		31	253	16	275
B. Hornet (linen)	1	360				70	1	290
Demy	3	185	5		1	263	6	402
Medium	2	190				316	1	354
Byron Weston		124	3		3	43		81
Imperial	1						1	
Letter heads, office (linen)		3,500		9,000		6,349		6,151
Letter heads, members (linen)		900		1,000		1,440		460
Foolscap	1	224				188	1	36
Legal cap		468				53		415
Blotting paper		230	1			301		409
Blue cover paper	3	320			2	35	1	285
Postoffice paper	1	200					1	200
Book paper, S. S. S. white	1	15					1	15
Manilla	3	408	4		4	190	3	218

There are now on hand 4,450 sheets of hard paper of half letter size. There were about 171,185 envelopes on hand at the time of making the last report; 175,000 of various kinds have been purchased since, making a total of 346,185. There are now on hand 85,166 printed envelopes, and 95,148 blank envelopes, making a total of 180,314. About 165,871 have been used in the work of the office.

The following is a classified statement of the expenditures of the Board for the fiscal year, 1899, reported in compliance with law: Previous to this report the appropriations were for the calendar year, and in previous reports an itemized summary of the expenditures of the Board was printed relative to the calendar year as well as to the fiscal year, but on account of the change in the method of appropriation, which is now made for the fiscal year, the report of the finances of the Board is not necessary for the calendar year. The expenditures of the Board for any fiscal year cannot exceed eight thousand five hundred dollars,—six thousand to meet the necessary expenses of the office and of the Board, including expenses of members in attending meetings, and pay the salary of the secretary. Two thousand five hundred dollars of the amount for the work of the Board is available under act No. 142, 1897, and is for the purpose of disseminating information to superintendents and teachers of schools, to enable them to comply with Act 146, Laws of 1895.

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF HEALTH (UNDER ACTS 18, 1873, AND 241, 1881), AS PER VOUCHERS 3038-3042, 3044, 3046-3051, 3053, 3055, 3057, 3058, 3060, 3061-3168, 3173, 3176-3187, INCLUSIVE, ALLOWED DURING THE FISCAL YEAR ENDING JUNE 30, 1900.

Expenses of members:—	
Attending meetings	$260 74
Other official	77 41
Instruments and books	110 30
Paper, stationery etc.	389 65
Postage:—	
Office	809 76
Members	25
Printing and binding	653 99
Secretary	3,000 00
Expressage	372 63
Telegrams	22 24
Telephone	23 45
Miscellaneous	279 58
Total	$6,000 00

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF HEALTH UNDER ACT 142, 1897, AS PER VOUCHERS 73, 75, 77, 78, 80-112 INCLUSIVE, ALLOWED DURING THE FISCAL YEAR ENDING JUNE 30, 1900.

Drawing, engraving, etc.	$0 70
Instruments and books	149 30
Paper, stationery, etc.	377 69
Postage:—	
Office	239 90
Printing and binding	1,710 85
Expressage	11 50
Miscellaneous	10 06
Total	$2,500 00

EXPENDITURES ON ACCOUNT OF THE BOARD.

The appropriations ($8,500.00) at the disposal of the State Board of Health are for certain specified purposes, not including clerk hire, the publication of the annual report, or the expenses in the examination of plans for public buildings; these expenditures *on account of*, but not by the Board, are provided for by other acts of the legislature than those appropriating money to be expended by the Board, and the accounts are kept in other offices; not in the office of the State Board of Health. The accounts for clerk hire are kept by the Auditor General, and are reported in his annual report; the accounts for the publication of the annual report of this Board, and in the examination of plans for public buildings, are kept by the Board of State Auditors, and are published in the annual report of that Board.

Respectfully submitted,
HENRY B. BAKER,
Secretary.

ABSTRACTS FROM THE QUARTERLY REPORTS OF WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH, AND OF THE CONDITION OF HEALTH IN MICHIGAN DURING THE SIX MONTHS ENDING JUNE 30, 1900.

For each regular meeting of the State Board of Health, the secretary prepares a report of work in the office, and of the condition of health in Michigan, during the preceding quarter. Up to and including the report of the secretary for 1898 these quarterly reports had been printed in detail under this heading in the Annual Report; but because of the new law, Act 44, 1899, it became necessary to omit all but a brief summary. It was customary, however, to include under this head the reports for the quarters of the *fiscal* year; that is from July 1 of a given year to and including June 30 of the following year, and such a course was followed up to this report. It became evident, however, that to the casual student of these statistics an apparent conflict arose between the statements in the quarterly reports and the data contained in the articles on the several diseases, which is for the *calendar* year only. The statements in the quarterly reports are not only for another twelve months than the articles on the diseases, but are also six months in advance of them. Therefore, it was deemed desirable to append a brief summary of the quarterly reports for each *calendar* year to the introduction to the articles on communicable diseases, pages 105-109. and retain under this head a summary of the first six months of the *fiscal* year only.

A summary of a few portions of the quarterly reports during the six months ending June 30, 1900, is as follows:

Dangerous communicable diseases.—The number of reports of outbreaks of dangerous communicable diseases in Michigan, received from all sources and filed, and the corresponding number concerning which action was taken by this office, for the six months ending June 30, 1900, are as follows: Of diphtheria and croup, 261; of scarlet fever, 439; of typhoid and typho-malarial fever, 310; of measles, 730; of whooping-cough, 184; of smallpox, 28; of consumption, 876; and of meningitis, 283. Total for the eight diseases, 3,113.

The number of communications relative to dangerous communicable diseases received and placed on file, was 12,910.

The number of communications relative to dangerous communicable diseases sent out, was 11,978.

The "final" reports of outbreaks received and filed were, for diphtheria and croup, 211; for scarlet fever, 413; for typhoid and typho-malarial fever, 279; for measles, 587; for whooping-cough, 104; for smallpox, 23; for consumption, 986; and for meningitis, 249. Total, for the eight diseases, 2,843.

The Monthly Bulletin of Vital Statistics issued by the State Department, has resulted in giving this office the first information of the occurrence of 58 deaths from diphtheria and croup; 17 deaths from scarlet fever; 87 deaths from typhoid and typho-malarial fever; 47 deaths from measles; 53 deaths from whooping-cough; 615 deaths from consumption; and 234 deaths from meningitis. A total, for the seven diseases, of 1,111.

The local columns of 5,471 newspapers have been looked over for reports of the occurrence of communicable diseases. (This work is done by the clerk who acts as messenger and janitor, in the intervals of his performance of other duties.) This has resulted in giving this office first information of the alleged occurrence of 5 outbreaks of diphtheria; 9 outbreaks of scarlet fever; 20 outbreaks of typhoid and typho-malarial fever; 35 outbreaks of measles; 9 outbreaks of whooping-cough; 1 outbreak of smallpox; 27 cases of consumption; and 2 cases of meningitis. A total for the eight diseases of 108. To what extent the reports of these alleged outbreaks were verified, is shown in the accompanying table:

TABLE 1.—FIRST SIX MONTHS, 1900.—*Exhibiting the number of outbreaks of diphtheria, scarlet fever, typhoid fever, measles, whooping-cough, smallpox, consumption and meningitis, from January 1 to June 30, 1900, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, first information concerning which was received through the newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of reports which were denied by the health officer; and the per cent relative to which no reply was received from the health officer.*

	Reports from all sources, January 1, to June 30, 1900.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria (includes croup)......	261	2	60	40	0
Scarlet fever......................	439	2	45	22	33
Typhoid fever (includes typho-malarial)	310	6	30	40	30
Measles...........................	730	5	43	14	43
Whooping-cough..................	184	5	33	22	45
Smallpox..........................	28	4	100	0	0
Consumption......................	876	3	74	19	7
Meningitis........................	285	1	50	0	50
Averages for the 8 diseases.......	....	3	49	22	29

Work in connection with sickness statistics.—When a return of the name of a new health officer was received, the printed circular [180] demanding the weekly card reports of sickness, and a hektographed circular letter describing the plan of making the card reports, together with supplies for making the reports, were sent to the health officer of each city and village. It must be remembered that the following applies only to the work on sickness statistics for the first six months of 1900, and that for the work of the calendar year 1899, reference must be made to the article on sickness statistics beginning on page 58 of this report. During the first six months of the year 1900, 3,710 blank report, receipt and return postal cards, 267 weekly record books, and 473 printed, hektographed and typewritten letters, were mailed to health officers of cities and villages, and voluntary correspondents; all of whom were understood to be physicians in active general practice of medicine. About 2,615 weekly postal card reports were received and entered on the register.

The sickness statistics of Michigan, based upon these weekly card reports, are probably the most important sickness statistics in the world, and are made especially useful for the purpose of studying the climatic causation of diseases, by reason of the excellent meteorological statistics which have been collected for a long series of years. The general plan of the weekly card reports, the sickness statistics obtained from the compilation of the weekly card reports received during the year 1899, and the data obtained from the meteorological observations during the year 1899, may be found on pages 1-104 of this report.

An ephemeral use is made of the data contained in the weekly card reports, and of the meteorological observations at Lansing, by the publication of weekly, monthly and quarterly bulletins, "Health in Michigan." Samples of the several bulletins may be found on page 85, Report for 1891, pages lxxix, and xcii-xciii, report for 1894, and pages lxxxvi-lxxxvii, report for 1898. During the first six months of 1900 about 80 copies of the weekly bulletin were mailed each week, and about 162 copies of the monthly bulletin were mailed each month, to members of the State Board of Health and other officials and persons interested in keeping a "finger on the public pulse," also to a number of newspapers and sanitary and medical journals. The weekly and monthly bulletins are mentioned on pages 60 and 61 of this report.

Meteorology at one central station, and sickness throughout Michigan from all causes, during the first six months of 1900, compared with the first six months of 1899.—A comparison of meteorological conditions, at Lansing, for the first six months of 1900, with the meteorological conditions for the first six months of 1899, shows that in 1900 the prevailing direction of the wind was northwest instead of southwest, the velocity 0.4 of a mile per hour greater, the average temperature 0.45 of a degree lower, the average daily range of temperature 0.7 of a degree less, the average daily range of atmospheric pressure .012 of an inch greater, the precipitation 0.33 of an inch more, the absolute humidity less, the relative humidity and the day and night ozone more, and the depth of water in the observation well 11 inches less. This data relative to the calendar year 1899 is printed in the article on meteorology beginning on page 1 of this report.

Compared with the first six months of 1899, the reports from all sources indicate an increased prevalence in the sickness from typhoid fever, measles, and whooping-cough, and a decreased prevalence in cerebro-spinal meningitis, in the first six months of 1900.

The weather and the health in Michigan, in the first six months of 1900 compared with the average for the corresponding six months in the ten years 1890-99.—A comparison of meteorological conditions, at Lansing, of the first six months of 1900, with the average for the corresponding six months in the ten years, 1890-99, shows that in 1900, the prevailing direction of the wind was northwest instead of southwest, the velocity 0.8 of a mile per hour less, the average temperature 1.07 degrees lower, the average daily range of temperature 0.28 of a degree less, the average daily range of atmospheric pressure .002 of an inch less, the precipitation .08 of an inch less, the absolute humidity less, the relative humidity the same, the day and night ozone less, and the depth of water in the observation well 17 inches less.

Compared with the average in the corresponding six months in the ten years, 1890-99, the reports from regular observers indicate that measles was more prevalent than usual, and cerebro-spinal meningitis, consumption, diphtheria, erysipelas, intermittent fever, remittent fever, pneumonia and whooping-cough less prevalent than usual, in the first six months of 1900.

[PART II.]

PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1899.

COMPARISONS OF CONDITIONS IN 1899 WITH THOSE IN PRECEDING YEARS.

A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF HEALTH AND FOR THE UNITED STATES WEATHER BUREAU.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE MICHIGAN STATE BOARD OF HEALTH.

In the annual reports of this Board, there has been published for each of the years 1877 to 1898, inclusive, a summary relative to the principal meteorological conditions observed during the year. This paper continues the subject for the year 1899. The names of the observers for that year, and the months in that year for which copies of registers of meteorological conditions were received from each, are stated in Exhibit 1. In Exhibit 2, is given the latitude, longitude, and elevation of each of these stations. In the tables which follow, reports received from any observer for less than half the year have not been used.

The principal conditions treated in the following tables are temperature, relative and absolute humidity of the air, cloudiness, fogs, rainfall, ground-water levels, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only the meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

In the latter part of the annual report for 1886, there was published an article on "The Causation of Pneumonia," in which extensive use was made of meteorological statistics, especially those relating to the meteorology of Michigan. In the annual report for 1887, in an article on "The Causation of the Cold-Weather Diseases," influenza, tonsillitis, bronchitis, scarlet fever, diphtheria, and smallpox are proved to sustain very close relations to meteorological conditions. Extensive use of meteorological and sickness statistics is made in the report for 1887, in an article entitled "The Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-Passages." In the report for 1891, "Abstract of Proceedings, April 14, 1891," in a discussion on the subject of "The Causation of Influenza," is an important use of the meteorological data, with diagrams and other evidence, showing how closely influenza is associated with atmospheric temperature, humidity, ozone, and wind. In the report for 1891, page cxxvii, is an article entitled "Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-Passages in Colorado," in which are also data relative to other States and countries. In the report for 1894, pages clix-ccxiv, is a paper on "The Causation of Influenza and Allied Diseases with Suggestions for their Prevention," in which important use is made of the meteorological data collected in Michigan since 1877. In each of the annual reports of this Board since that for the year 1877, considerable use has been made of the sickness statistics in Michigan for the complete study of which, data of the meteorological conditions coincident with the sickness is required.

EXHIBIT 1.—*Names of observers whose reports are summarized in the following meteorological tables and diagrams, their places of observation, and the counties and geographical divisions of the State in which these places are situated, and months for which reports were received from each observer.*

Name of observer.	Place of observation.	County.	Divisions of the State.*	Months (inclusive) for which registers were received.
W. C. Gates, M. D.	Rockland	Ontonagon	U. P.	Jan. to May, July to Oct.
H. R. Patrick, Observer, U. S. Weather Bureau	Marquette	Marquette	U. P.	January to December.
C. L. Bozzell, Observer, U. S. Weather Bureau	Sault Ste. Marie	Chippewa	U. P.	January to December.
S. E. Wait	Traverse City	G'd Traverse	N. W.	January to December.
H. McP. Baldwin, Observer, U. S. Weather Bureau	Alpena	Alpena	N. E.	January to December.
D. W. Mitchell, M. D.	Harrisville	Alcona	N. E.	January to December.
John A. Harrison	Conklin	Ottawa	W.	January to December.
George W. Felger, Observer, U. S. Weather Bureau	Grand Haven	Ottawa	W.	January to December.
R. Q. Grant. Observer, U. S. Weather Bureau	Port Huron	St. Clair	B. & E.	January to December.
John S. Caulkins, M. D.	Thornville	Lapeer	B. & E.	January to December.
E. S. Pettyjohn, M. D.	Alma	Gratiot	C.	January to December.
Prof. R. C. Kedzie	Agricultural College.	Ingham	C.	January to December.
T. S. Ainge	Office State B'd of Health, Lansing	Ingham	C.	January to September.
William M. Force	Office State B'd of Health, Lansing	Ingham	C.	October to December.
Asaph Hall, Jr., Director, Detroit Observatory	Ann Arbor	Washtenaw	S. C.	January to December.
J. H. Kellogg, M. D.	Battle Creek	Calhoun	S. C.	January to December.
C. C. Teift	Tecumseh	Lenawee	S. C.	January to December.
S. Alexander	Birmingham	Oakland	S. E.	January to December.
Norman B. Conger, Local Forecast Official, U. S. W. Bureau	Detroit	Wayne	S. E.	January to December.

*The counties in each division are stated in Exhibit I, in preceding reports.

The article in this annual report relative to "Causes of Diseases," based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as a basis for studies of the causes of diseases.

It is believed that there is nowhere else so complete a statement of the facts relating to meteorology of Michigan as is here presented, for any use for which such knowledge may be needed, now or hereafter.

EXHIBIT 2.—*Latitude and longitude, elevation above sea level, and the average temperature and average barometric pressure in 1899, at meteorological stations in Michigan,—the names of the stations being arranged in order by latitude, highest first.*

Localities in order of latitude, those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (approximate) above sea level.—Feet.	Height of mercury in cistern of barometer above sea level.—Feet.	Average temperature 1899. Degrees Fahr.	Average atmospheric pressure, 1899. Inches of mercury corrected for temp.
Rockland	....	....	1,190.34	....	....	....
Marquette	46°34′	87°24′	669.	....	....	....
Sault Ste. Marie	46°28′	84°22′	642.	....	....	....
Alpena	45°5′	83°3′	587.	....	....	....
Traverse City	44°45′	85°40′	598.	605.	45.17	29.318
Alma	43°42′	87°75′	784.	790.	47.80	....
Harrisville	43°40′	83°30′	616.	....	42.92	29.329
Conklin	43°8′	85.55′	....	....	....	....
Grand Haven	43°5′	86°18′	590.	....	....	....
Port Huron	43°0′	82°26′	602.	....	....	....
Thornville	* 42°55′	* 83°10′	§ 975.	§ 980.	48.03	28.981
Agricultural College	42°44′	84°29′	820.	834.	47.77	29.075
Lansing, S. B. of H	† 42°44′	† 84°33′	¶ 900.	917.	48.09	29.085
Birmingham	42°30′	83°10′	‡ 752.	....	48.44	29.087
Detroit	42°20′	83°3′	585.	730.	....	....
Battle Creek	42°20′	85°11′	800.	....	....	29.355
Ann Arbor	42°17′	83°44′	930.	936.	48.14	29.054
Tecumseh	* 42°1′	* 83°57′	835.	840.	47.90	29.153

*Estimated from lines on a map of Michigan, issued by the General Land Office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

†The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42° 43′ 53.11″ N. and 84° 33′ 19.68″ W.

‡Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

§Estimated from data in Tackabury's Atlas of the State of Michigan.

¶Estimated from comparisons of the barometrical observations at Lansing, Port Huron, and Grand Haven for the four years, 1879-82.

NOTE.—Green's standard barometer was used at the above stations for the year 1899.

EXHIBIT 3.—*Average temperature by year and months, for the year 1899, and the average for the 22 years, 1877-98. These averages are for groups of several stations in Michigan.*

Years, etc.	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 22 yrs.,'77-98.	46.40	21.65	23.46	30.16	44.79	56.25	66.45	70.95	68.13	61.66	49.31	36.13	27.85
1899................	47.14	22.20	17.09	26.89	49.17	59.00	69.13	70.54	71.98	58.51	53.28	41.03	26.83

EXHIBIT 4.—*Average temperature by year and months, for the year 1899, and the average for the 20 years 1879-98, at the office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 yrs.,'79-98.	47.41	22.54	24.12	31.67	46.41	58.14	68.20	72.13	68.70	62.01	49.85	36.67	28.43
1899................	48.09	23.03	18.14	27.73	51.24	60.49	70.39	71.80	72.27	59.01	54,31	41.09	27.56

EXHIBIT 5.—*Average temperature by year and months, for the year 1899, and the average for the 35 years, 1864-98, at the Agricultural College, Michigan.*

Years, etc.	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 35 yrs.,'64-98.	46.62	21.99	23.72	31.10	45.96	57.98	67.81	71.44	68.64	60.68	48.24	35.48	26.55
1899................	47.77	21.80	16.20	27.32	51.40	59.77	70.20	70.70	76.56	58.60	54.10	40.04	26.49

Meteorological characteristics of the year 1899 in Michigan.—At the several meteorological stations, in different parts of the State, the average temperature for 1899 was .74° higher than the average for the preceding twenty-two years; the annual range of temperature was 4° greater than in 1898, and 16° greater than the annual range for the preceding twenty-two years; the average monthly range of temperature was 4° greater than in 1898, and 5° greater than the average for the preceding twenty-two years. The average daily range of temperature was .96° greater than in 1898, and .18° greater than the average for the preceding twenty years; the average cloudiness was four per cent less than in 1898, and three per cent less than the average for the preceding twenty years; the rainfall (rain and melted snow) was 5.61 inches less than in 1898, and 6.81 inches less than the average for the preceding twenty-two years; the average atmospheric pressure was .080 of an inch greater than in 1898, and .029 of an inch greater than the average for the preceding twenty-two years.

In Exhibit 6, is given by year and months, a comparison of conditions in 1899, in Michigan, with those in 1898, and with the averages of periods of years. Naming the months in order of greatest difference, November, April, October, August, May, June, and January, were months in which the average temperature in 1899 was higher than

EXHIBIT 6.—*Statements of meteorological conditions in the year, and in each month of the year 1899, compared with the annual and monthly averages for 1898, and for several stated periods of years. These statements and averages are for* **groups of several stations in Michigan.**

Meteorological conditions.	1899 Compared with averages for previous years.		In 1899 more (+), or less (—), than in 1898.	Meteorological conditions.	1899 Compared with averages for previous years.		In 1899 more (+), or less (—), than in 1898.
	No. of years averaged, end'g with 1898.	More (+), or less (—), in 1899 than the average for previous years			No. of years averaged, end'g with 1898.	More (+), or less (—), in 1899 than the average for previous years	
YEAR 1899.				YEAR 1899.			
Av. temp.	22	+.74°	—.48°	*Continued.*			
Range of temp.*	22	+16°	4°	Cloudiness	22	—3 per ct.	—4 per ct.
Av. monthly range of temp.*	22	+5°	+4°	Rainfall	22	—6.81 in.	—5.61 in.
Av. daily range of temp.*	20	+.18°	+.96°	Atmospheric pressure	22	+.029 in.	+.080 in.
JANUARY.				FEBRUARY.			
Av. temp	22	.55°	—3.45°	Av. temp	22	—6.37°	—7.38°
Range of temp.*	22	5°	—7°	Range of temp.*	22	+21°	+3°
Av. daily range of temp.*	20	—.06°	+1.41°	Av. daily range of temp.*	20	+.15°	+2.62°
Cloudiness	22	—8 per ct.	—8 per ct.	Cloudiness	22	—11 per ct.	—23 per ct.
Rainfall	22	—.60 in.	—1.37 in.	Rainfall	22	—1.05 in.	—1.14 in.
Atmospheric pressure	22	+.030 in.	+.149 in.	Atmospheric pressure	22	—.046 in.	+.011 in.
MARCH.				APRIL.			
Av. temp	22	—3.27°	—9.89°	Av. temp	22	+4.28°	+5.40°
Range of temp.*	22		—4°	Range of temp.*	22	+12°	+13°
Av. daily range of temp.*	20	—2.17°	—1.77°	Av. daily range of temp.*	20	+.94°	+2.43°
Cloudiness	22	+16 per ct.	+16 per ct.	Cloudiness	22	—5 per ct.	—4 per ct.
Rainfall	22	+.84 in.	—.19 in.	Rainfall	22	—1.24 in.	—.37 in.
Atmospheric pressure	22	—.077 in.	—.095 in.	Atmospheric pressure	22	—.042 in.	+.040 in.
MAY.				JUNE.			
Av. temp	22	+2.75°	+2.09°	Av. temp	22	+2.68°	+1.38°
Range of temp.*	22	+1°	+10°	Range of temp.*	22	—2°	+1°
Av. daily range of temp.*	20	—.13°	+1.12°	Av. daily range of temp.*	20	+1.44°	+.79°
Cloudiness	22	+1 per ct.	+1 per ct.	Cloudiness	22	—11 per ct.	—7 per ct.
Rainfall	22	—.40 in.	+.70 in.	Rainfall	22	—.70 in.	—.93 in.
Atmospheric pressure	22	+.076 in.	+.144 in.	Atmospheric pressure	22	+.100 in.	+.124 in.

*By registering thermometers.

Comments on Exhibit 6 are printed on pages 4 and 6.

The low temperature for February and the small amount of rainfall for the year 1899 are especially noticeable.

EXHIBIT 6.—CONTINUED.—*Meteorological conditions at stations in Michigan, in months, for the year 1899, compared with averages for corresponding months in preceding years.*

Meteorological conditions.	1899 Compared with averages for previous years.		In 1899 more (+), or less (—), than in 1898.	Meteorological conditions.	1899 Compared with averages for previous years.		In 1899 more (+), or less (—), than in 1898.
	No. of years averaged, end'g with 1898.	More (+), or less (—), in 1899 than the average for previous years			No. of years averaged, end'g with 1898.	More (+), or less (—), in 1899 than the average for previous years	
JULY.				AUGUST.			
Av. temp.	22	—.41°	—1.60°	Av. temp.	22	+3.85°	+2.55°
Range of temp.*	22	+4°	+5°	Range of temp.*	22	+2°	+4°
Av. daily range of temp.*	20	—.71°	—2.26°	Av. daily range of temp.*	20	+2.43°	+3.38°
Cloudiness	22	—7 per ct.	+18 per ct.	Cloudiness	22	—11 per ct.	—16 per ct.
Rainfall	22	—.36 in.	+1.92 in.	Rainfall	22	—1.86 in.	—2.04 in.
Atmospheric pressure	22	+.029 in.	+.013 in.	Atmospheric pressure	22	+.025 in.	+.085 in.
SEPTEMBER.				OCTOBER.			
Av. temp.	22	—3.15°	—5.70°	Av. temp.	22	+3.97°	—3.16°
Range of temp.*	22	+16°	+5°	Range of temp.*	22	—1°	—4°
Av. daily range of temp.*	20	—.29°	—.27°	Av. daily range of temp.*	20	+1.77°	+4.42°
Cloudiness	22	+8 per ct.	+13 per ct.	Cloudiness	22	—14 per ct.	—28 per ct.
Rainfall	22	—.03 in.	+.19 in.	Rainfall	22	—.26 in.	—1.60 in.
Atmospheric pressure	22	+.024 in.	+.097 in.	Atmospheric pressure	22	+.128 in.	+.190 in.
NOVEMBER.				DECEMBER.			
Av. temp.	22	+4.90°	+5.66°	Av. temp.	22	—1.02°	+2.12°
Range of temp.*	22	—3°	+17°	Range of temp.*	22	+7°	+8°
Av. daily range of temp.*	20	—.39°	—.40°	Av. daily range of temp.*	20	—.80°	+.11°
Cloudiness	22	—2 per ct.	—1 per ct.	Cloudiness	22	—5 per ct.	—8 per ct.
Rainfall	22	—1.67 in.	—1.11 in.	Rainfall	22	—.24 in.	+.32 in.
Atmospheric pressure	22	+.049 in.	+.121 in.	Atmospheric pressure	22	—.035 in.	+.077 in.

*By registering thermometers.

the average for corresponding months in the preceding twenty-two years; February, March, September, December and July were months in which the average temperature in 1899 was lower than the average for corresponding months in the preceding twenty-two years.

Whoever will carefully study Diagram I, in this article, and in similar articles for preceding years, will see that thermometers and methods of observation have become so perfect that, given a curve representing correctly the temperature by months at one station in Michigan, curves can readily be constructed without actual records, which will somewhat closely represent the temperature at each of several other stations, because the curves for many stations run so nearly parallel that all that is necessary to do is to find the average difference of mean annual temperature at the station to be represented compared with the station for which the data are given. It may also be seen that a curve representing the temperature at a station in the Central part of the State very closely resembles the curve representing the average for many stations representing nearly all parts of the State. This proves that the practice adopted many years ago of stating the meteorological characteristics at one central station is a reasonably safe practice, and it is especially useful when it enables us to gain a comparison for a longer period than can be made from records at many stations, and also when employed in advance of the receipt of records from all stations, as is the case when the weekly bulletins of "Health in Michigan" are issued, for the purposes for which the meteorological conditions at the State Capitol are used to represent the conditions probably prevailing throughout the State.

LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1899.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1899, are taken from the monthly reports by observers. The names of stations are appended; the names of observers are stated in Exhibit 1.

JANUARY.

Depth of snow on ground, Jan. 15, 2.9 inches; Jan. 31, 13.3 inches.—*Marquette.*

January was a moderate winter month—except the last five days, which were excessively cold and windy. There was no sleighing to speak of and the prospect for wheat is unpromising.—*Thornville.*

Bees were out Jan. 23.—*Parkville.*

No snow on ground, Jan. 15 and 31. Some lilac trees budded, Jan. 13, and several other softwood trees budded about the same time. Some sleighing, Jan. 7 and 8 (poor). Frost in ground, Jan. 1-31.—*Lansing.*

FEBRUARY.

Depth of snow on ground, Jan. 15, 10.6 inches; Jan. 31, 5.2 inches.—*Marquette.*

From Jan. 8 to 14, was the coldest on record for 32 years. All kinds of fruits killed. Only a very few orchards where the trees can be saved and then not for certainty. Nearly all cellars froze, doing great damage to potatoes and canned fruits.—*Conklin.*

Thunder storm, Feb. 26. February was notable for extremes of temperature. The first 14 days were a continuation of the cold weather that began Jan. 27. The last half of the month was warm, the total range of the mercury being 76°, from −22° to 54°. The cold term is the severest on record for at least 50 years. The damage to wheat is immense, there having been no snow on the ground to protect it. Potatoes too are generally frozen in pits and many in cellars. Peach buds are killed. There are in some places three feet of frost in the ground.—*Thornville.*

Exceedingly and continued cold weather from Feb. 9 to 14; thermometer remaining below zero nearly all of that time.—*Alma.*

Bees were out, Feb. 16-26. Robins seen, Feb. 21.—*Parkville.*

Cold wave Feb. 1; 4-14, inclusive, 26 and 28. Depth of snow on ground, Feb. 14, one-quarter inch, Feb. 28, one-half inch. Thunderstorm, Feb. 26. Frost in ground said to average about four feet in depth during the month. The minimum temperatures, Feb. 11 and 12, were the lowest since Jan. 6 and 7, 1887; and the continued low temperature in the first part of this month, the coldest since Feb., 1885.—*Lansing.*

MARCH.

Depth of snow on ground, Mar. 15, 25.2 inches; March 31, 10.9 inches.—*Marquette.*

Thunderstorm of snow, Mar. 22. March was a cold, blustering, stormy month, with low barometrical pressure and heavy precipitation. Although there was no zero weather the mean temperature was lower than that of February. Robins first seen, Mar. 20. Song sparrows, Mar. 26.—*Thornville.*

Total snowfall for month, 24.1 inches, which is the greatest amount for March in the past 28 years.—*Detroit.*

Bees were out, Mar. 11.—*Parkville.*

Heavy frosts, Mar. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31. Light frost, Mar. 11. Song sparrow heard, Mar. 10. Wild geese flying north, Mar. 10. Robins seen, Mar. 11, yellow birds, Mar. 15, and bluebirds and blackbirds, Mar. 16. Poor sleighing, Mar. 6, 7, 8, 21, 22, 23, 24, 25, 26. Depth of snow on ground Mar. 15, none. Mar. 31, about two inches.—*Lansing.*

APRIL.

Robins arrive, Apr. 6. Ice went out of Grand Traverse Bay, Apr. 17. Martins arrive, Apr. 27.—*Traverse City.*

Frost all out of ground, about Apr. 25.—*Conklin.*

Did not freeze at night, Apr. 11, 12. Frogs first heard, Apr. 12. No frost after Apr. 15. Lilac buds opening, Apr. 21. Apple tree buds opening, June-berry blossoming, Apr. 26. Maple buds opening, Apr. 28. Sweet cherries blossom, Apr. 29. Plums and pears blossom, Apr. 30. Meadow-larks and wild doves first seen, Apr. 20. Whippoorwill heard, Apr. 12. Orioles first seen, Apr. 30. The month was very dry; the first half, cold and backward; the latter, warm and growing. As it closes, the season is not backward at all; it is an early spring. The wheat has done better than was expected from such a dry month, but is now in need of rain. The above remarks apply as well to the grass. The prospect for fruit, too, except peaches is much better than was at one time feared. Although the spring is early, work is much behind because the winter was so long.—*Thornville.*

Heavy frosts, Apr. 1, 2, 3, 4, 5, 8, 9, 16. Light frosts, Apr. 6, 7, 10, 15. Grand River open, about Apr. 7. Meadow-lark seen, Apr. 11. Golden oriole, Apr. 21; yellow-hammer, Apr. 20. Capitol lawn mowed, first time of season, Apr. 25. Lilacs budded, Apr. 10. Grass began to look green about Apr. 13. Soft maples in blossom, Apr. 14. Apples budded, Apr. 20. Soft maples scattering their blossoms, Apr. 21. Dandelions, early cherry and plum in bloom, Apr. 27; apricot, currant and gooseberry, Apr. 26. Frogs heard, first time of season, Apr. 12. Frost probably out of ground, Apr. 14. Butterfly seen, Apr. 18. The maximum temperature, Apr. 29, was the highest for April on record at this station, beginning with 1879.—*Lansing.*

MAY.

General navigation opened, May 2.—*Marquette.*

Light frost, May 20.—*Conklin.*

Light frosts, May 20, 21, 22, no damage. Dandelions blossom, May 2. Mandrakes come up, May 5. Apple trees blossom, May 3. Rye heads out, May 24. Bobolinks return, May 8; barn swallows, May 22; cuckoos, May 24. May was a cool, dry month, very favorable for work but not for growth. It warmed up a little and rained some toward the last of the month. After that things grew rapidly. Owing to the droughty character of April and May the prospect for wheat and grass is very poor. Oats are filling out well, and the outlook for fruit, except peaches, is good. As the month closes corn is about all planted, with some beans.—*Thornville.*

Lilac and some apple trees in bloom, May 2. Wheat heading out, May 31. Light frosts reported outside the city, May 20 and 22. None observed at this station.—*Lansing.*

JUNE.

Wheat heading out, June 1. Clover in blossom, June 9. Haying begins, June 21. Barley and oats heading, June 22.

June was a continuation of the May drought with the same cool nights; as a consequence all crops are poor. Hay (mostly harvested) is light. Wheat (which will soon be ready) is lighter; oats some better, but getting pinched. Timely rains will help out beans, corn and potatoes, and things yet to grow. All kinds of fruit are scarce. It is a very discouraging year for the agricultural part of community.—*Thornville.*

JULY.

Uncommonly dry month.—*Conklin.*

Katydids first heard, July 24. A month of drought with hot days and cool nights. There was considerable rainfall, but it came in such small showers it did very little good. Crops are poor, especially wheat and grass. Plentiful rains, right away, would help corn, beans, potatoes and pastures materially.—*Thornville.*

Commenced cutting wheat in this vicinity, July 6, and oats, about July 24.—*Lansing.*

AUGUST.

August was a dry, hot, dusty time, but with cool nights; a continuation of the long drought, now apparently broken by the heavy rain (1.85 inches), which fell the last day and night of the month. A bad year for farmers. Fruit, hay and wheat were failures. Oats were a disappointment, being light in weight and very smutty. Corn is not half eared; beans are not half a good crop. Fruit is next to nothing. Perhaps this rain may be the making of a good crop of potatoes, the last hope now for the agricultural community. The rain will be beneficial to pastures and to wheat seeding and clover.—*Thornville.*

SEPTEMBER.

Light frost on low grounds, Sept. 13. Heavy frost, Sept. 14, killed some corn and potatoes. Killing frost, Sept. 27. Froze heavy at night, Sept. 28, 29, 30. The summer drought was ended by the heavy rains, Sept. 17 and 18, but the frost came so soon it did little good to the potatoes, but much for pastures, wheat seeding and sugar beets.—*Thornville.*

Light frosts, Sept. 14, 27. Severe frost, Sept. 30.—*Ann Arbor.*

Killing frost, Sept. 23. Depth of snow on ground, Sept. 15, none. Sept. 30, 2.2 inches.—*Marquette.*

Heavy frosts, Sept. 6, 20. Killing frost, Sept. 22.—*Sault Ste. Marie.*

Heavy frost, Sept. 14. Killing frost, Sept. 23.—*Alpena.*

Light frost, Sept. 14. Heavy frost, Sept. 27. Killing frost, Sept. 30; occurred once previously on Sept. 26, 1883.—*Detroit.*

Light frost, Sept. 21. Killing frost, first of season, Sept. 14, 27, 30. A few flakes of snow fell, first of season, Sept. 29. Ground froze and ice formed, first time of season, morning of Sept. 30.—*Lansing.*

OCTOBER.

Killing frosts, Oct. 1, 7, 20, 29.—*Marquette.*

Light frosts, Oct. 2, 30.—*Port Huron.*

A very pleasant warm month for the season, favorable for work and for the growth of wheat and rye, which have a fine top on them to go into winter quarters with. There is yet some corn to get cribbed (perhaps half of the crop), otherwise everything is done except with the few who are raising sugar beets.—*Thornville.*

Frosts, Oct. 1, 21, 30. Seismograph stopped, 1:39 P. M., Oct. 7.—*Ann Arbor.*

Killing frosts, Oct. 1, 7, 18, 20, 21, 30, 31. Light frosts, Oct. 5, 6, 8, 9. Ice formed and ground froze, Oct. 1.—*Lansing.*

NOVEMBER.

Total snowfall for month, 3.2 inches.—*Marquette.*

Light frost, Nov. 5. Heavy frosts, Nov. 7, 9, 21. Killing frosts, Nov. 6.—*Port Huron.*

November was a dry month of mild temperature, very favorable for all kinds of work. On account of the lack of rain wheat does not look as well as it did three weeks ago, but it has a very fair top on it. The top is too dry, but it would do if covered right away with a coat of snow. A soaking rain before the shutup would be better.—*Thornville.*

Flurry of snow, first of season, 4:00 P. M., Nov. 2. Frosts, Nov. 6, 7, 8, 9. Heavy frosts, Nov. 20, 21. Seismograph stopped at 11:34 A. M., Nov. 16.—*Ann Arbor.*

Light frost, Nov. 21. Killing frosts, Nov. 1, 5, 6, 7, 8, 9, 16, 20, 27. Ice formed, Nov. 2, 5, 6. Snow commenced falling, about 9:00 A. M., Nov. 3, and continued until during night or morning of Nov. 4. Actual measurement, four inches. Estimated at 10 inches, as it continued to melt all day and night. Ground froze, Nov. 5, 6, 7, 8, 12, 20. Dandelions in bloom, Nov. 6, 9, 18, 20, 21. Indian summer, Nov. 8, 9, 13, 16, 17, 18, 20, 27.—*Lansing.*

DECEMBER.

Depth of snow on ground, Dec. 15, 20.6 inches; Dec. 31, 15 inches.—*Marquette.*

First snow storm, Dec. 6. Did not freeze at night, Dec. 8, 9. The closing month of the year was mild and pleasant till Christmas, then severe winter set in.—*Thornville.*

Ice formed in Grand River, first of season, Dec. 5. Grand River frozen over in places, Dec. 6. No frost in ground, Dec. 12. Grand River closed, first time of season, Dec. 25. Skating on Grand River, first of season, Dec. 27. Depth of snow on ground Dec. 15, two inches. Dec. 31, two inches.—*Lansing.*

EXHIBIT 7.—*Depth of wells; depth of ground above water in well; temperature of water in well, and day of observation of such temperature, in each month of the year 1899, as reported by meteorological observers for the State Board of Health, and for the United States Weather Bureau. (The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.)*

Stations in Michigan	January.			February.			March.			April.			May.			June.		
	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.
Traverse City*............	....	....	......	55	40 2	48^{28}	55	40	46^{22}	55	39 9	46^{28}	....	....	......	55	39 5	48^{12}
Lansing, S. B. of H........	26 11½	25 11	55^{16}	26 11½	26 4½	50^{15}	26 11½	25 9½	48^{16}	26 11½	25 10½	49^{15}	26 11½	25 10½	50^{16}	26 11½	25 10	50^{15}
Ann Arbor	17	10 7	44^{25}	17	11 3	43^{15}	17	11 8	42^{20}	....	....	......	17	12 3	43^{17}	17	12 9	46^{18}
Battle Creek..............	68	4	54^{6}	81	56	52^{22}	81	56	50^{12}	81	61	51^{13}	81	61	51^{13}	81	61 1	52^{18}
Conklin	18 6	3 2	33^{15}	18 6	3 2	32^{15}	18 6	3	35^{20}	18 6	3	46^{16}	18 6	4 2	53^{19}	18 6	4 6	57^{17}

Stations in Michigan.	July.			August.			September.			October.			November.			December.		
	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.	Depth of well. —Ft., in.	Depth of ground above water in well. —Ft., in.	Temp. of water in well.—Deg. Fahr.
Traverse City*............	55	40	48^{19}	55	40	48^{28}	....	....	......	....	....	......	....	....	......	....	....	......
Lansing, S. B. of H........	26 11½	26 2	51^{17}	26 11½	26 6½	50^{16}	26 11½	26 9	53^{15}	†	....	......	†	....	......	†	....	......
Ann Arbor.................	12 10	2	51^{17}	14 10	11	54^{19}	14 10	13 4	57^{17}	14 10	13 4	56^{18}	14 10	13 1	53^{18}	14 10	13	47^{17}
Battle Creek..............	81	60 10	52^{17}	81	62 2	53^{17}	81	60 5	51^{16}	....	....	......	81	56	52^{15}	81	62	51^{17}
Conklin	18 6	4	57^{16}	18 6	4 2	60^{15}	18 6	3 11	56^{16}	18 6	4	40^{18}	18 6	3 9	45^{15}	18 6	3 8	38^{15}

*At Northern Michigan Asylum, Alfred Newman, observer.

†Well dry,—severe drought.

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

Temperature of the atmosphere.—The average temperature by months, for the 20 years, 1879-98, at Lansing, and a comparison of 1899, by months, with that average, are stated in Exhibit 10.

The average temperatures at each of 12 stations in Michigan, and the average for 9 stations in 1899, and in each month of that year, are stated in Table I.

EXHIBIT 8.—*Average temperature by year and months in 1899, compared with annual and monthly averages for 1898, and for the 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Average temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98	46.40	21.65	23.46	30.16	44.79	56.25	66.45	70.95	68.13	61.66	49.31	36.13	27.85
Av. 20 years, 1879-98	46.14	21.50	22.70	29.81	44.32	56.22	66.46	70.70	67.87	61.44	49.09	35.95	27.66
1898 (9 stations).....	47.62	25.65	24.47	36.78	43.77	56.91	67.75	72.14	69.43	64.21	50.12	35.47	24.71
1899 (9 stations).....	47.14	22.20	17.09	26.89	49.17	59.00	69.13	70.54	71.98	58.51	53.28	41.03	26.83
In 1899 higher than av. for 22 years, 1877-98.............	.74	.55	......	......	4.38	2.75	2.68	......	3.85	......	3.97	4.90	......
In 1899 lower than av. for 22 years, 1877-98.............	......	......	6.37	3.27	......	......	......	.41	......	3.15	......	......	1.02
In 1899 higher than in 1898.............	......	......	......	......	5.40	2.09	1.38	......	2.55	......	......	5.56	2.12
In 1899 lower than in 1898.............	.48	3.45	7.38	9.89	......	......	......	1.60	......	5.70	3.16	......	......

*At from 9 to 22 stations per year for the 22 years, 1877-98. Just which stations in each year, up to 1897, are shown on page 17, report for 1898.

NOTE.—Beginning with the year 1885, allowance must be made for Lansing in Exhibit 8, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, report for 1886.

The average annual and monthly temperatures at from 9 to 22 stations for a period of twenty-two years, 1877-98, are stated in Exhibit 8, in which is also given, by months, a comparison of 1899 with the average for 1898, and with the averages for the twenty-two years, 1877-98. By Exhibit 8, which gives averages for groups of several stations in Michigan, it appears that in 1899 the mean temperature in January, February, March, July, September and October was lower than in those months in 1898. It also appears that April, May, June, August, November and December were warmer than the average temperature for the corresponding months for the twenty-two years, 1877-98.

TABLE I.—*Average temperature in degrees Fahr., for the year, and by months of the year 1899, at each of 12 stations in Michigan, and also an average line for 9 stations. From observations made daily at 7 A. M., 2 P. M. and 9 P. M., local time, by observers* for the State Board of Health.*

Stations in Michigan.*	Divisions of the State. ‡‡	Temperature in degrees Fahr.													
		Year.		Months, †† 1899.											
		Norm. §	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.
Average, 9 stations†..	....	.....	47.14	22.20	17.09	26.89	49.17	59.00	69.13	70.54	71.98	58.51	53.28	41.03	26.83
Rockland..............	U. P.	......	¶	[e] 11.33	[e] 9.10	[d] 14.64	[f] 43.63	[g] 53.11	.....	[h] 65.59	[f] 67.01	[f] 52.43	.....	.....	.....
Traverse City.........	N. W.	44.49^{17}	45.17	20.35	12.12	22.93	45.58	55.16	66.63	68.39	[e] 70.60	[b] 56.98	52.85	43.00	27.46
Harrisville...........	N. E.	43.01^{11}	42.92	18.85	14.54	22.49	40.46	51.75	62.76	64.53	67.04	56.57	51.37	[b] 39.82	24.90
Conklin...............	W.	......	§§	.....	.....	27.61	50.88	61.72	70.87	73.42	80.35	59.72	41.43	57.34	29.65
Thornville............	B. & E.	47.92^{23}	48.03	23.03	17.92	27.99	50.44	60.58	69.86	71.71	72.33	59.13	53.80	42.00	27.53
Alma..................	C.	48.96^{2}	47.80	21.61	18.07	26.54	50.74	61.87	72.21	72.40	72.46	57.69	[a] 52.28	41.09	26.59
Agr'l College.........	C.	49.15^{36}	47.77	21.80	16.20	27.32	51.40	59.77	70.20	70.70	76.56	58.60	54.10	40.04	26.49
Lansing, S. B. of H.‡..	C.	47.44^{21}	48.09	23.03	18.14	27.73	51.24	60.49	70.39	71.80	72.27	59.01	54.31	41.09	27.56
Ann Arbor.............	S. C.	47.18^{19}	48.14	23.10	18.10	28.60	50.80	60.30	69.50	72.20	72.70	59.31	53.90	41.52	27.60
Battle Creek..........	S. C.	......	¶¶	24.43	19.37	[a] 29.87	53.77	62.62	72.43	.....	83.48	[b] 64.18	56.16	42.17	29.34
Tecumseh..............	S. C.	......	47.90	23.70	19.54	29.20	50.63	60.58	69.80	71.26	71.33	59.14	52.85	40.20	26.60
Birmingham............	S. E.	48.05^{13}	48.44	[a] 24.36	[d] 19.17	[a] 29.24	[c] 51.25	[a] 60.52	70.78	[c] 71.85	72.52	[c] 60.14	[a] 54.10	40.52	[a] 26.77

*The names of observers, their place of observation, and the counties in which these places are situated, are stated in Exhibit 1.

†This line is an average for only the nine stations from which statements nearly complete were received for every month of the year. It does not include Rockland, Conklin and Battle Creek.

§Numbers in this column state the average annual temperature for periods of years ending in each case with December 31, 1899. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

††The computations for average temperature, as tabulated for months in 1899, were made at the following stations: Ann Arbor and the Agricultural College. All other computations in Table I were made at the office of the State Board of Health.

‡Beginning with the year 1885, allowance must be made for Lansing in Table I, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, report for 1886.

‡‡The names of divisions, and the counties in each, are stated in Exhibit I, in preceding reports.

¶The average for 8 months is 39.61. §§For 10 months, 55.30. ¶¶For 11 months. 48.89.

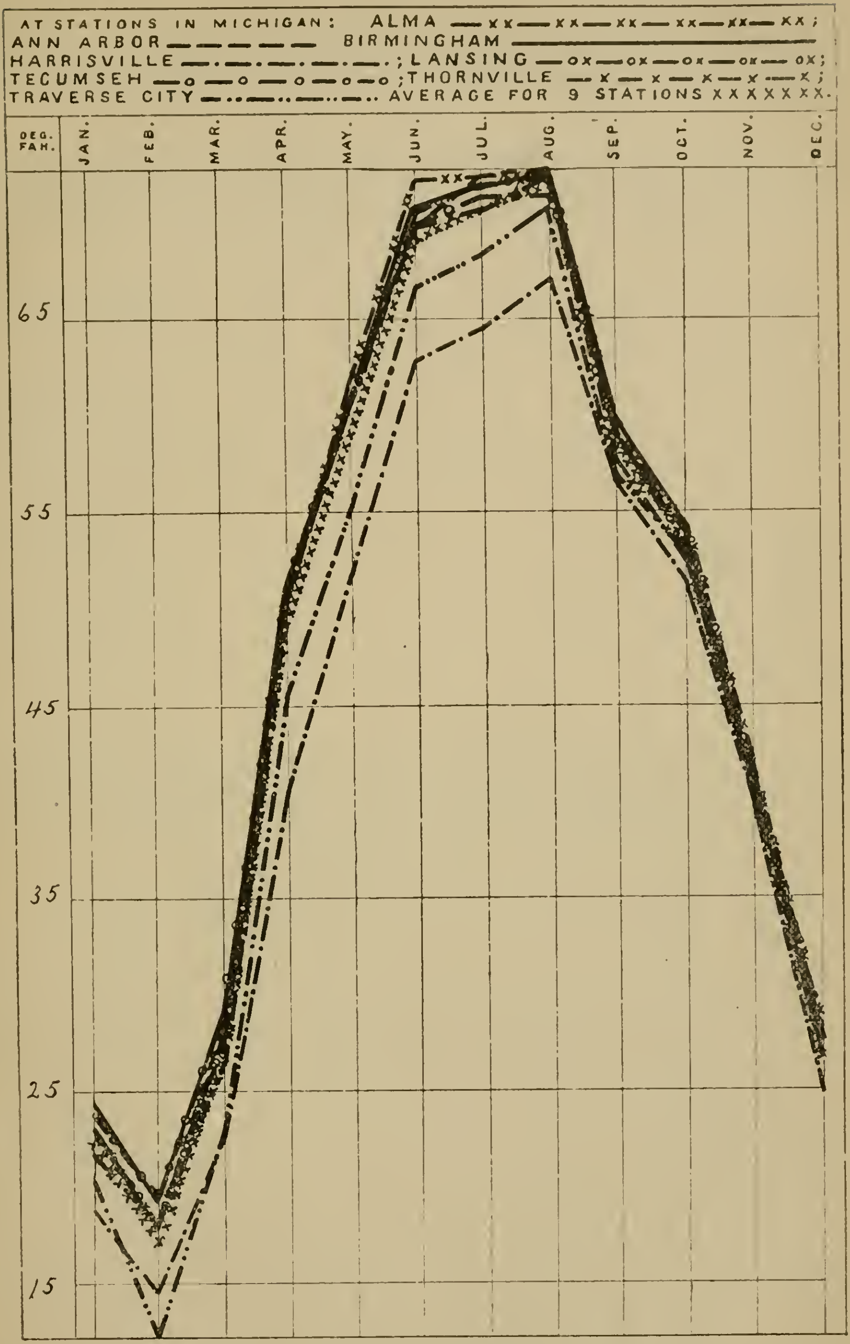
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 22 days. h For 21 days.

The average line and lines for eight representative stations in Table I are graphically represented in Diagram I.

The average daily range of temperature at from 6 to 19 stations per year, by months, for a period of twenty years, 1879-98, and a comparison of 1899 with the monthly averages for that period and for 1898, are given in Exhibit 12. The highest and lowest temperatures in every month in 1899, at each of fifteen stations, are stated in Table II. The average daily range of temperature by months in 1899, at each of

DIAGRAM I.—AVERAGE TEMPERATURE BY MONTHS, 1899.



[PLATE 1039.]

eighteen stations, and the average for fifteen of the stations, are stated in Table III. The lines for ten of these stations, and the average line for fifteen of the stations, are represented in Diagram II. It will be noticed that the greatest average daily range occurred during the month of August.

EXHIBIT 9.—*Comparison of the average temperature during the year and during each month of the year 1899, with the annual and with the monthly averages for the year 1898, and with the averages for the 35 years, 1864-98. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, etc.	Average temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 35 years, 1864-98	46.62	21.99	23.72	31.10	45.96	57.98	67.81	71.44	68.64	60.68	48.24	35.48	26.55
1898................	48.17	26.21	24.49	37.56	44.37	58.37	69.19	73.01	70.45	63.58	50.43	34.40	25.99
1899................	47.77	21.80	16.20	27.32	51.40	59.77	70.20	70.70	76.56	58.60	54.10	40.04	26.49
In 1899 **higher** than av. for 35 years, 1864-98............	1.15	......	......	......	5.44	1.79	2.39	......	7.92	......	5.86	4.56	......
In 1899 **lower** than av. for 35 years, 1864-98............	....	.19	7.52	3.78	......	......	......	.74	......	2.08	......	......	.06
In 1899 **higher** than in 1898............	....	......	......	......	7.03	1.40	1.01	......	6.11	......	3.67	5.64	.50
In 1899 **lower** than in 1898............	.40	4.41	8.29	10.24	......	......	......	2.31	......	4.98	......	......	......

EXHIBIT 10.—*Average temperature by year and months in 1899* compared with annual and monthly averages for 1898, and for the 20 years, 1879-98. Observations made at office State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Average temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 20 years, 1879-98	47.41	22.54	24.12	31.67	46.41	58.14	68.20	72.13	68.70	62.01	49.85	36.67	28.43
1898................	48.94	27.73	25.33	38.87	44.90	58.49	69.76	73.48	70.90	64.52	50.85	35.78	26.67
1899................	48.09	23.03	18.14	27.73	51.24	60.49	70.39	71.80	72.27	59.01	54.31	41.09	27.56
In 1899 **higher** than av. for 20 years, 1879-98............	.68	.49	......	......	4.83	2.35	2.19	......	3.57	......	4.46	4.42	......
In 1899 **lower** than av. for 20 years, 1879-98............	....	......	5.98	3.94	......	......	......	.33	......	3.00	......	......	.87
In 1899 **higher** than in 1898............	....	......	......	......	6.34	2.00	.63	......	1.37	......	3.46	5.31	.89
In 1899 **lower** than in 1898............	.85	4.70	7.19	11.14	......	......	......	1.68	......	5.51	......	......	......

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*Beginning with the year 1885, slight allowance should be made for Lansing in Exhibit 10, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, report for 1886.

EXHIBIT 11.—*Average temperature in degrees Fahr., for the year and months, 1899, at office State Board of Health, State Capitol, Lansing, Michigan, computed from readings at 7 A. M., 2 P. M. and 9 P. M., daily, from registers of the Draper self-recording thermometer, compared with observations made with Green's standard mercurial thermometer at the same hours; both thermometers placed in double latticed shelter for instruments, in the southwest part of the Capitol yard.*

Tri-daily readings of instruments specified.	Year.	Average temperature, in degrees Fahr.—Year and months, 1899.											
		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. temp. from tri-daily observations with Green's standard mercurial thermometer............	48.09	23.03	18.14	27.73	51.24	60.49	70.39	71.80	72.27	59.01	54.31	41.09	27.56
Av. temp. computed from readings of the Draper's self-recording thermometer..................	45.64	22.21	17.86	26.02	48.23	57.01	66.33	67.78	69.11	55.25	50.90	39.01	27.94
Higher by Draper's than by Green's thermometer.......	......	......	......	......	......	......	......	......	......	......	......	......	.38
Lower by Draper's than by Green's thermometer.......	2.45	.82	.28	1.71	3.01	3.48	4.06	4.02	3.16	3.76	3.41	2.08	......

EXHIBIT 12.—*Average daily range of temperature, by year and months, in 1899, compared with annual and monthly averages for 1898, and for the 20 years, 1879-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Average daily range of temperature—Degrees Fahr.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 20 years, 1879-98*................	17.98	15.34	16.78	17.33	19.07	20.26	20.75	21.10	20.42	20.18	17.25	14.13	13.16
1898 (12 stations)...	17.20	13.87	14.31	16.93	17.58	19.01	21.40	22.65	19.47	20.16	14.60	14.14	12.25
1899 (15 stations)...	18.16	15.28	16.93	15.16	20.01	20.13	22.19	20.39	22.85	19.89	19.02	13.74	12.36
In 1899 greater than av. for 20 years, 1879-98......	.18	......	.15	......	.94	......	1.44	......	2.43	......	1.77	......	......
In 1899 less than av. for 20 years, 1879-98............	....	.06	......	2.17	......	.13	......	.71	......	.29	......	.39	.80
In 1899 greater than in 1898........	.96	1.41	2.62	......	2.43	1.12	.79	......	3.38	......	4.42	......	.11
In 1899 less than in 1898................	....	......	......	1.77	......	......	......	2.26	......	.27	......	.40	......

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*At from 6 to 19 stations per year for the 20 years, 1879-98. Just which stations in each year, up to 1897, are shown on page 21, report for 1898.

TABLE II.—*Extremes of temperature and days of month on which the highest and range for the year 1899, at each of 15 stations in Michigan.—As indicated by daily P. M. and 9 P. M., by observers* for the State Board of Health, and for the United*

Line number.	Stations in Michigan.* (Those of the U. S. Weather Bureau in italics.)	Year 1899.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 15 Stations†	104	-37	141	51	-28	60	-37	66	-13	91	5	93	27
2	Rockland ‡	......	......	......	41^{13}	-28^{29}	49^{20}	-29^{10}	39^{14}	-8$^{9, 20}$	84$^{28, 29}$	11^{1}	88^{3}	26^{14}
3	*Marquette*§	91	-23	114	41^{15}	-18^{31}	43^{17}	-23^{10}	34^{2}	-5^{17}	76^{29}	14^{1}	84^{12}	30^{14}
4	*Sault Ste. Marie*§	87	-37	124	37^{4}	-28$^{27, 31}$	43$^{16, 17}$	-37^{10}	33^{11}	-13^{1}	70^{29}	11^{5}	76^{31}	30^{15}
5	Traverse City‡	95	-33	128	43$^{4.15}$	-18^{30}	47$^{20, 21}$	-33^{10}	50^{11}	0^{1}	91^{29}	12^{3}	85^{12}	29^{14}
6	*Alpena* §	93	-13	106	42^{15}	-13^{31}	49^{11}	0^{1}	49^{11}	0^{1}	72^{28}	14^{2}	84^{1}	30^{15}
7	Harrisville†	92	-25	117	46^{15}	-16^{30}	51^{21}	-25^{10}	47^{11}	0^{13}	75^{28}	11^{1}	83^{31}	27^{14}
8	Conklin††	97	-30	127	48^{4}	-4^{30}	22^{28}	-30^{11}	46$^{14, 15}$	5^{30}	85^{29}	15^{3}	78^{1}	33^{20}
9	*Grand Haven*§	93	-25	118	45^{4}	-4^{31}	48^{26}	-25^{11}	52^{12}	1^{7}	84^{27}	22$^{3, 4}$	77^{3}	38$^{20, 21}$
10	*Port Huron* §	97	-15	112	51^{4}	-8^{31}	58^{26}	-15$^{10, 11, 12}$	56$^{11, 15}$	6^{8}	84^{30}	21^{3}	83^{1}	38^{14}
11	Thornville ‡	97	-22	119	50^{4}	-8$^{29, 31}$	54^{26}	-22$^{11, 13}$	56^{11}	10^{8}	87^{30}	16^{3}	82$^{1, 31}$	35^{21}
12	Alma‡	......	......	......	‡‡42^{3}	-22^{30}	51^{26}	-24^{10}	46^{11}	5^{31}	85^{29}	15^{3}	82^{1}	37^{20}
13	Lansing, S. B. of H.‡¶	95	-19	114	49^{4}	-10^{30}	59^{26}	-19$^{11, 12}$	61^{11}	7^{6}	86^{29}	16^{2}	82^{31}	36^{19}
14	Ann Arbor‖	99	-16	115	50^{4}	-12^{31}	60^{26}	-16$^{10, 12, 13}$	60^{11}	6^{8}	88^{29}	15^{3}	86^{2}	35^{22}
15	Battle Creek‡	104	-17	121	50^{4}	-10^{31}	52^{20}	-17$^{9, 11}$	66^{11}	5^{6}	91^{29}	15^{2}	93^{30}	37$^{19, 20}$
16	Tecumseh‡	92	-15	107	50^{4}	-9^{30}	53^{20}	-15$^{8, 9, 10, 14}$	59^{11}	7^{7}	86^{30}	19^{2}	81^{2}	30^{20}
17	Birmingham ‡	97	-15	112	46^{3}	-13^{30}	56^{26}	-15$^{9, 10, 11}$	58^{11}	7^{7}	87^{30}	20^{2}	85^{2}	37^{20}
18	*Detroit* §	95	-13	108	50^{4}	-4^{31}	55^{26}	-13^{10}	58^{11}	11$^{7, 8}$	84^{30}	5$^{1, 2}$	84^{1}	39^{22}

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature, state the day or days of the month on which the highest or lowest temperature occurred.

*The names of observers, etc., are stated in Exhibit 1.

†The line No. 1, and the three columns for the year 1899, relate only to the fifteen stations from which observations were received for every month of the year. It does not include Rockland and Alma.

‡For stations marked thus ‡, the daily readings of registering thermometers were recorded at 7 A. M. for the preceding calendar day.

‡‡The maximum temperature for January was taken from the "Thermometer in open air."

§At the stations of the U. S. Weather Bureau, the maximum thermometer was read and recorded at 8 :00 A. M., and the minimum at 8 :00 P. M., 75th Meridian time. The local time at these stations corresponding to 8 :00 A. M. and 8 :00 P. M., 75th Meridian time, is as follows: At Port Huron, 7 :30 A. M. and 7 :30 P. M.; at Detroit, 7 :28 A. M. and 7 :28 P. M.; At Alpena, 7 :26 A. M. and 7 :26 P. M.: at Grand Haven, 7 :15 A. M. and 7 :15 P. M.; At Marquette, 7 :11 A. M. and 7 :11 P. M.; at Sault Ste. Marie, 7 :23 A. M. and 7 :23 P. M.

‖ At Ann Arbor, the maximum thermometer was read at 7 A. M., and the minimum thermometer at 9 P. M., except for January, when the minimum temperature was taken from the "Thermometer in open air."

¶Beginning with the year 1885 allowance must be made for Lansing in Table II, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit B, on page 22, report for 1886.

††At Conklin the registering thermometers were read at 9 :00 P. M.

the lowest temperature occurred by months of the year 1899; also, extremes and readings of registering thermometers, or by observations made daily at 7 A. M., 2 States Weather Bureau.*

June.		July.		August.		September.		October.		November.		December.		
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Line number.
97	37	104	42	104	42	103	21	85	21	84	19	59	-17	1
......	....	23 90	31 30	28 88	6 45	2 80	29 25	23 80	2 23	......	....	......	....	2
4 91	2 40	23 89	7 46	28 89	14 45	2 87	30 30	23 78	1 31	7 63	12 28	21 50	31 –2	3
27 83	2 38	28 84	19 42	19 87	14 44	2 84	30 28	16 73	21 29	7 56	12 19	23 43	30 –17	4
4 91	1 40	24 95	8 47	20 94	13 45	2 90	30 27	23 78	19 31	7 58	2 25	11 49	29, 30 –3	5
4 91	2 44	1 87	31 48	18 93	15 42	2 88	29 29	24 79	8 31	9 60	13 22	12 50	30 –7	6
7, 13 88	9 38	1 88	30 46	18 92	15 43	5 87	29 29	24 79	20 31	9 60	12 20	1 47	29, 30 –10	7
6 88	16 37	20 89	9 45	11 97	15 58	2 92	29 25	7, 18 58	6 24	15 84	19, 20 30	1 59	30 –10	8
3 84	2, 10 46	23 93	9, 31 50	28 91	15 50	2 86	29, 30 33	15 82	1 28	17, 20 57	29 27	11 57	30 4	9
6 97	3 43	7 89	30 50	20 94	8 48	7 94	30 30	15 79	1, 2 32	18 63	8 30	11 59	30 –2	10
5, 22 90	11, 30 45	24 92	31 50	20 97	16 44	7 93	30 29	13 80	1 27	18 63	13 26	11 55	30 –6	11
6 91	3, 15, 29 50	24 91	18, 19 52	....	....	8 92	26, 30 30	16, 23 79	1 25	18 57	7 28	11 57	29, 30 –3	12
22 92	16 42	24 95	8, 30 48	19 95	15 45	7 95	30 23	15 85	1 26	18 61	5, 6, 7 29	11 58	29 –4	13
22 94	11 45	24 96	9 49	19 99	7 46	7 96	30 27	15 84	1 21	18 63	12 25	11 58	30 –7	14
4, 6, 22 96	11 38	23 104	8 48	29 104	14 50	2 103	30 26	15 84	30 32	18 63	11 21	11 58	30 –9	15
22 90	15 47	4 90	30 50	19 90	6, 7, 15 51	7 92	30 24	14 80	1 27	19 59	6 25	11 53	29, 30 –4	16
22 97	10 42	24 95	30 45	16, 19, 20 97	7 43	7 96	30 21	15 83	20 29	18 63	6 23	11 55	29, 30 –3	17
22 90	16 49	4 90	9 56	19 92	14 53	7 95	30 30	15 79	1 32	17 58	12 29	11 59	30 0	18

TABLE III.—*Average daily range of temperature, by registering thermometers for the year and by months of the year 1899, at each of 18 stations in Michigan, and also an average line for 15 stations.*

Stations in Michigan.* (Those of the U. S. Weather Bureau in italics.)	Divisions of the State.†	Normal. ††	Year 1899.	Average daily range of temperature—Degrees Fahr.											
				Months, 1899.											
				Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 15 Stations§	......	......	18.16	15.28	16.93	15.16	20.01	20.13	22.19	20.39	22.85	19.89	19.02	13.74	12.36
Rockland	U. P.	......	¶	[b] 24.14	[e] 26.15	[c] 23.71	[c] 28.86	[f] 28.84	.....	[e] 24.04	[a] 21.47	[b] 20.90	[h] 27.10	.....	.....
Marquette	U. P.	14.98^{14}	14.10	12.90	13.40	13.10	14.40	16.90	19.10	15.70	15.00	13.70	15.00	10.20	9.80
Sault Ste. Marie	U. P.	17.12^{8}	18.46	17.40	20.60	19.90	18.60	20.80	22.00	20.70	19.40	22.70	15.00	10.60	13.80
Traverse City	N. W.	19.76^{18}	20.42	19.42	22.29	20.61	24.83	22.87	22.30	19.90	[d] 23.07	19.73	21.29	15.67	13.00
Alpena	N. E.	15.50^{20}	15.31	14.16	16.90	13.10	16.00	18.06	18.27	16.13	17.13	16.27	16.00	10.40	11.32
Harrisville	N. E.	19.85^{15}	19.85	20.97	23.32	21.10	18.77	19.55	22.70	19.42	21.06	20.73	18.49	15.77	16.32
Conklin	W.	......	19.54	14.74	12.32	19.40	23.30	22.19	26.47	18.58	20.81	23.40	15.75	22.23	15.23
Grand Haven	W.	15.26^{10}	16.01	12.70	13.75	12.30	18.50	19.60	20.20	16.00	20.80	18.20	17.50	12.70	9.90
Port Huron	B. & E.	15.80^{20}	15.72	13.70	15.20	13.30	20.00	18.30	20.80	18.90	19.60	16.00	16.60	10.80	5.40
Thornville	B. & E.	21.54^{20}	16.53	12.06	13.86	10.94	19.23	19.58	22.17	20.58	23.87	18.43	18.26	11.07	8.35
Agr'l College	C.	21.14^{18}	21.95	15.30	19.30	15.40	26.40	23.40	24.70	30.50	33.00	23.60	23.00	15.70	13.10
Alma	C.	......	**	[§§] 12.64	[i] 16.52	15.61	25.07	21.10	21.20	19.77	.....	26.53	19.84	14.20	11.68
Lansing, S. B. of H.	C.	20.41^{21}	19.52	16.35	18.11	16.00	20.17	21.03	23.30	21.81	26.81	22.53	21.52	14.07	12.55
Ann Arbor	S. C.	18.42^{18}	20.58	12.94	[‡] 17.04	13.10	22.40	23.02	24.90	25.00	29.30	23.20	25.10	15.50	15.40
Battle Creek	S. C.	......	‡‡	15.81	19.79	18.26	27.07	29.52	30.43	31.84	34.35	31.10	.....	[g] 23.75	23.45
Tecumseh	S. C.	......	18.61	16.32	16.79	13.39	20.50	20.10	20.97	20.68	22.58	21.10	20.94	15.17	14.74
Birmingham	S. E.	20.86^{13}	21.27	17.65	18.14	14.39	[b] 20.31	20.42	27.40	25.29	32.03	[b] 23.21	25.10	16.13	15.13
Detroit	S. E.	15.47^{21}	14.59	12.60	12.90	11.40	16.80	16.20	17.60	16.60	18.30	15.60	15.70	10.10	11.30

*The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1.

†The counties in each division are stated in Exhibit I, in preceding reports.

‡The minimum temperature was taken from the "Thermometer in open air."

††Numbers in this column state the annual average range of temperature for periods of years ending in each case with December 31, 1899. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§This line is an average for all stations for which statements nearly complete are given for every month of the year. It does not include Rockland, Alma and Battle Creek.

¶The average for 9 months is 25.02. **For 11 months 18.56. ‡‡For 11 months 25.94.

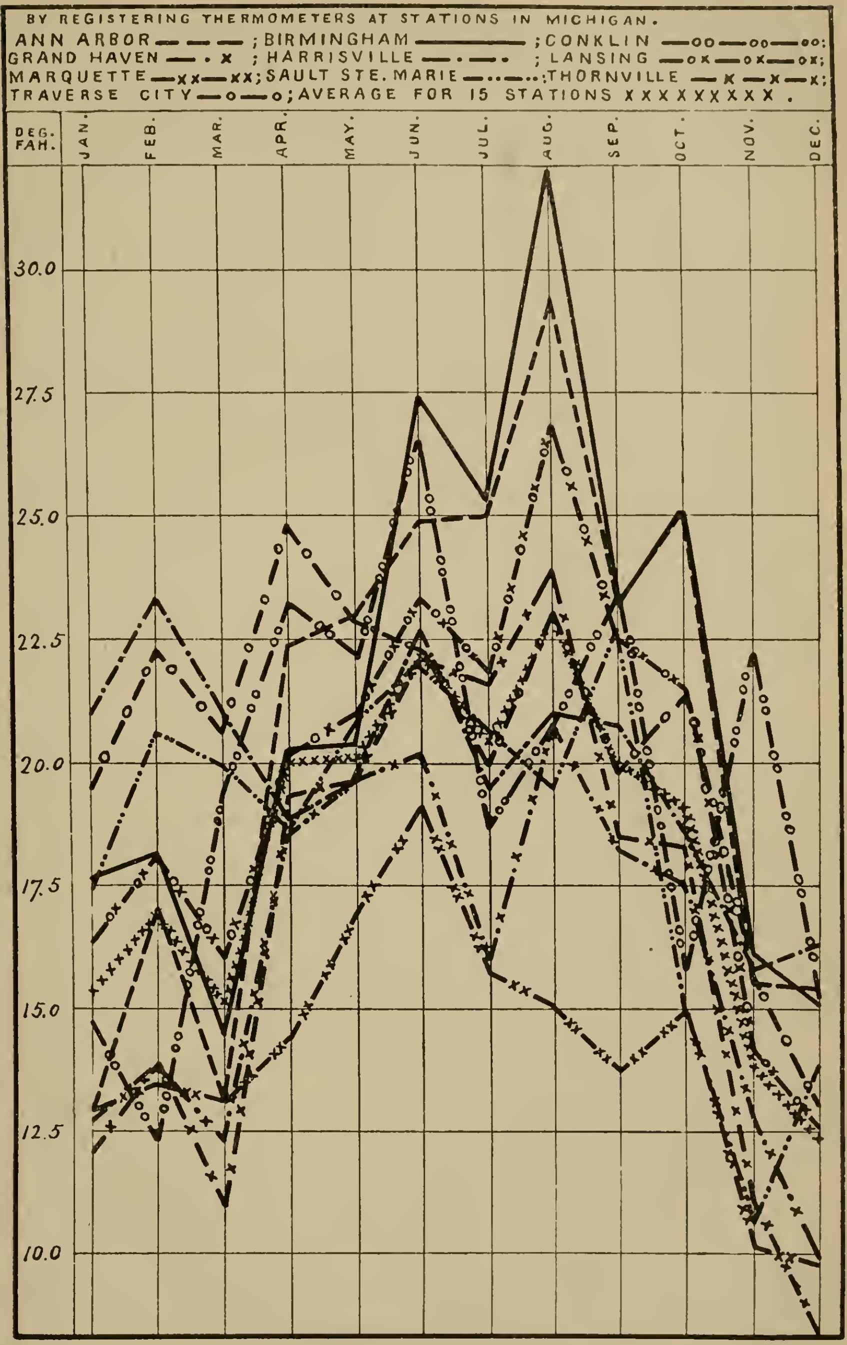
§§The maximum temperature was taken from the "Thermometer in open air."

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 24 days. h For 21 days. i For 16 days.

Graphic representations of statements in Table III are given in Diagram II.

DIAGRAM II.- AV. DAILY RANGE OF TEMPERATURE BY MONTHS, 1899.



[PLATE 1040.]

EXHIBIT 13.—*Comparisons of the extremes and the range of temperature (degrees Fahr.) during the year, and during each month of the year 1899, with the average of the extremes, and of the range, for the 22 years, 1877-98, also statement of the extremes and of the range for each of the seven years, 1893-99. Observations made with registering thermometers by observers for the State Board of Health, and for the U. S. Weather Bureau. These comparisons, etc., are for* **groups of several stations in Michigan.**

Year and months.	Extremes and ranges of temperature—Degrees Fahrenheit.																										
	1893.			1894.			1895.			1896.			1897.			1898.			Av. for 22 years, 1877–98.			1899.*			1899 higher (+), or lower (—), than av. 22 years, 1877–98.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year ...	97	-26	123	102	-26	128	100	-28	128	98	-25	123	102	-21	123	100	-18	118	100	-25	125	104	-37	141	+4	-12	+16
Av. mo.	77	11	66	81	10	71	80	9	71	78	9	69	78	10	68	79	13	66	79	11	68	83	10	73	+4	+1	+5
Jan	49	-26	75	57	-18	75	50	-12	62	45	-25	70	58	-19	77	58	-10	68	54	-20	74	51	-28	79	-3	-8	+5
Feb	44	-23	67	54	-26	80	54	-28	82	59	-22	81	46	-21	67	57	-18	75	55	-21	76	60	-37	97	+5	-16	+21
March .	66	-6	72	79	-2	81	69	-16	85	69	-16	85	70	-14	84	70	-3	73	66	-13	79	66	-13	79	=	=	=
April ..	80	9	71	88	12	76	82	17	65	87	7	80	79	5	74	78	8	70	83	9	74	91	5	86	+8	-4	+12
May	88	27	61	94	30	64	98	26	72	98	33	65	84	22	62	83	29	54	89	24	65	93	27	66	+4	+3	+1
June ...	96	36	60	98	33	65	99	37	62	91	37	54	92	27	65	96	39	57	95	33	62	97	37	60	+2	+4	-2
July ...	96	43	53	102	37	65	100	38	62	95	39	56	102	46	56	99	37	62	98	40	58	104	42	62	+6	+2	+4
August	97	38	59	99	32	67	97	36	61	96	35	61	94	38	56	100	42	58	97	37	60	104	42	62	+7	+5	+2
Sept ...	89	22	67	99	29	70	98	28	70	88	22	66	98	28	70	98	32	66	94	28	66	103	21	82	+9	-7	+16
Oct	84	22	62	80	20	60	80	10	70	77	15	62	91	25	66	89	16	73	84	19	65	85	21	64	+1	+2	-1
Nov	68	6	62	67	-7	74	72	-1	73	67	-3	70	65	-5	70	67	3	64	69	1	68	84	19	65	+15	+18	-3
Dec	62	-14	76	60	-19	79	63	-24	87	59	-16	75	57	-16	73	51	-17	68	58	-11	69	59	-17	76	+1	-6	+7

*For the twenty-three years, 1877-99, the highest temperature was 105°, at Battle Creek, September 9, 1884; the lowest was -37°, at Sault Ste. Marie, February 10, 1899.

EXHIBIT 14.—*Average absolute humidity, by year and months in 1899, compared with annual and monthly averages for 1898, and for the 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Absolute humidity—Grains of vapor in a cubic foot of air.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98	3.47	1.45	1.53	1.84	2.83	4.01	5.58	6.08	5.77	4.94	3.50	2.32	1.79
1898 (7 stations).....	3.57	1.46	1.53	2.33	2.67	4.24	5.78	6.05	6.04	5.31	3.75	2.22	1.47
1899 (7 stations).....	3.54	1.40	1.22	1.53	3.28	4.40	5.68	6.09	5.89	4.58	3.95	2.72	1.69
In 1899 **greater** than average for 22 years, 1877-98......	.07	......	......	......	.45	.39	.10	.01	.12	......	.45	.40	......
In 1899 **less** than average for 22 years, 1877-98......	....	.05	.31	.31	......	......	......	.04	......	.36	......	......	.10
In 1899 **greater** than in 1898.......	....	......	......	......	.61	.16	......	......	......	......	.20	.50	.22
In 1899 **less** than in 1898................	.03	.06	.31	.80	......	......	.10	......	.15	.73	......	......	......

*At from 6 to 23 stations per year for the twenty-two years, 1877-98. Just which stations in each year, up to 1897, are shown on page 27, report for 1898.

NOTE.—Beginning with the year 1885, allowance must be made for Lansing in Exhibit 15, because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C, on page 23, report for 1886.

EXHIBIT 15.—*Average relative humidity, by years and months, in 1899, compared with annual and monthly averages for 1898, and for the 21 years, 1878-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Per cent of saturation—Relative humidity.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 years, 1878-98	76	83	82	78	71	70	73	71	73	76	76	80	83
1898 (8 stations).....	77	81	81	78	72	74	74	68	75	75	80	80	82
1899 (8 stations).....	77	81	79	82	72	74	71	75	70	76	79	80	82
In 1899 **greater** than average for 21 years, 1878-98......	1	......	......	4	1	4	......	4	......	0	3	0	......
In 1899 **less** than average for 21 years, 1878-98......	....	2	3	......	......	......	2	......	3	......	......	......	1
In 1899 **greater** than in 1898.......	0	0	......	4	0	0	......	7	......	1	......	0	0
In 1899 **less** than in 1898................	....	......	2	......	......	......	3	......	5	......	1	......	......

*At from 7 to 22 stations per year for the 21 years, 1878-98. Just which stations in each year, up to 1897, are shown on page 28, report for 1898.

NOTE.—Beginning with the year 1885, allowance must be made for Lansing in Exhibit 16, because of a change in the location of instruments. The amount of the variation is shown in Exhibit D, on page 23, report for 1886.

TABLE IV.—ABSOLUTE HUMIDITY.—*The average number of grains of vapor of water in a cubic foot of air for months and year, 1899, at 10 stations in Michigan; also average line for 7 stations.—Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M., by observers* for the State Board of Health.*

Stations in Michigan.*	Divisions of the State. †	Grains of vapor in a cubic foot of air.—(Absolute humidity.)§													
		Year.		Months, 1899.											
		Norm. ‡	1899.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 stations.¶	....	......	3.54	1.40	1.22	1.53	3.28	4.40	5.68	6.09	5.89	4.58	3.95	2.72	1.69
Traverse City.....	N. W.	3.40^{18}	3.46	1.49	1.22	1.52	3.00	3.95	5.43	5.98	i 6.15	c 4.32	3.88	2.76	1.84
Harrisville........	N. E.	3.07^{5}	3.19	1.26	0.95	1.20	2.61	3.73	5.04	5.46	5.82	4.32	3.87	c 2.56	1.48
Conklin...........	W.	......	**	.....	.....	1.43	3.68	4.78	6.74	6.77	7.08	c 4.87	2.74	c 4.69	a 1.80
Thornville........	B. & E.	3.65^{23}	3.56	1.67	1.44	1.82	3.38	4.48	5.53	5.95	5.67	4.44	3.70	2.71	1.89
Alma..............	C.	3.81^{2}	3.85	1.34	g 1.17	a 1.42	3.57	4.79	e 6.33	6.61	a 6.48	h 5.19	e 4.46	2.97	1.83
Lansing, S. B. of H.‖............	C.	3.38^{21}	3.42	1.32	1.19	1.49	3.32	4.40	5.55	6.02	5.41	4.35	3.77	2.65	1.62
Ann Arbor........	S. C.	......	††	1.28	1.21	f 1.43	3.08	4.02	5.39	5.09	5.42	4.14	3.64	2.41	.....
Battle Creek......	S. C.	......	§§	1.80	1.60	a 2.15	c 3.69	4.89	7.40	.....	g 9.56	d 5.80	4.59	2.73	1.94
Tecumseh.........	S. C.	......	3.65	1.40	1.28	1.64	3.54	4.74	6.03	6.30	6.00	4.67	3.82	2.70	1.68
Birmingham......	S. E.	3.64^{13}	3.62	1.31	h 1.31	a 1.63	d 3.56	a 4.70	5.84	b 6.28	5.69	c 4.78	a 4.15	c 2.69	a 1.48

*The names of the observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1.

†The full names of the divisions and the counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average annual absolute humidity for periods of years ending in each case with December 31, 1899. The small figures above and at the right of numbers which state the absolute humidity denote the number of years included in the average.

§The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII., of the Smithsonian Meteorological and Physical Tables (1859).

¶This line is an average for only the seven stations from which statements nearly complete were received for every month of the year. It does not include the lines for Conklin, Ann Arbor and Battle Creek.

**The average for ten months is 4.46. ††For 11 months, 3.37. §§For 11 months, 4.19.

‖Beginning with the year 1885, allowance must be made for Lansing in Table IV., because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C, page 23, report for 1886.

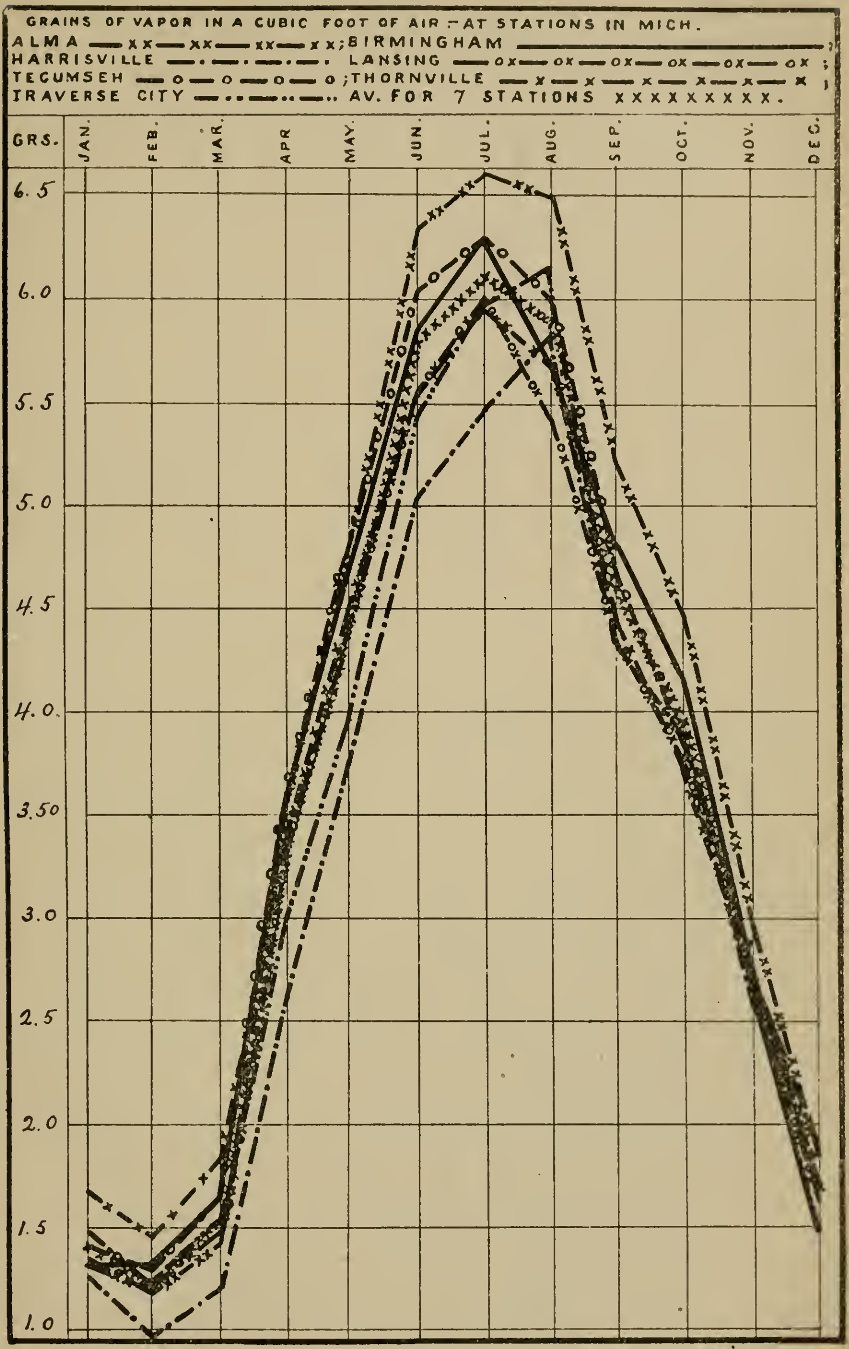
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations.	b For 91 observations.	c For 89 observations.
d For 87 observations.	e For 86 observations.	f For 84 observations.
g For 83 observations.	h For 82 observations.	i For 81 observations.

NOTE—The computations of absolute humidity at Ann Arbor for each month in 1898 were furnished by the observer there. All other computations in Table IV. were made at the office of the Secretary of the State Board of Health.

The "average" line and the lines for seven stations in Table IV are graphically represented in Diagram III.

DIAGRAM III.- ABSOLUTE HUMIDITY, BY MONTHS, 1899.



[PLATE 1041]

TABLE V.—Relative Humidity.—*Average per cent of saturation of the atmosphere with vapor of water for months and year 1899 at 11 stations in Michigan; also average line for 8 stations. Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M., by observers* for the State Board of Health.*

Stations in Michigan.*	Divisions of the State.†	Per cent of saturation.—Relative humidity.													
		Year.		Months, 1899.											
		Norm. ‡	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations§	....	......	77	81	79	82	72	74	71	75	70	76	79	80	82
Traverse City.....	N. W.	81^{18}	79	90	89	90	74	72	72	77	f 74	b 74	76	77	88
Harrisville........	N. E.	69^{5}	75	77	66	73	77	77	74	78	76	74	80	b 79	74
Conklin...........	W.	......	¶	.....	.....	70	72	71	77	75	62	b 74	a 79	b 76	a 76
Thornville	B. & E.	78^{22}	76	90	89	88	69	68	65	69	62	70	70	78	89
Alma..............	C.	76^{2}	78	72	f 67	a 76	71	74	d 71	75	a 74	e 87	g 90	90	89
Agr'l College.....	C.	80^{36}	89	99	99	97	83	86	84	87	79	87	86	88	93
Lansing, S. B. of H.¶¶..............	C.	72^{21}	69	71	72	74	62	68	63	69	61	69	71	78	74
Ann Arbor........	S. C.	......	**	79	77	e 78	66	70	67	68	61	70	73	78	.....
Battle Creek......	S. C.	......	§§	91	93	a 92	b 67	71	82	....	a 81	b 82	83	77	85
Tecumseh.........	S. C.	......	74	74	72	78	71	75	72	74	69	73	75	73	79
Birmingham	S. E.	76^{13}	73	a 72	f 79	a 78	c 69	a 73	68	b 74	65	b 76	a 81	b 80	a 69

*The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1.

†The full names of the divisions, and the counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average annual relative humidity for periods of years ending in each case with December 31, 1899. The small figures above and at the right of the numbers which state the relative humidity, denote the number of years included in the average.

§This line is an average for only the 8 stations from which statements nearly complete were received for every month in the year. It does not include Conklin, Ann Arbor and Battle Creek.

¶The average for 10 months is 73. **For 11 months, 72. §§For 11 months, 82.

¶¶Beginning with the year 1885, allowance must be made for Lansing in Table V, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit D, on page 23, report for 1886.

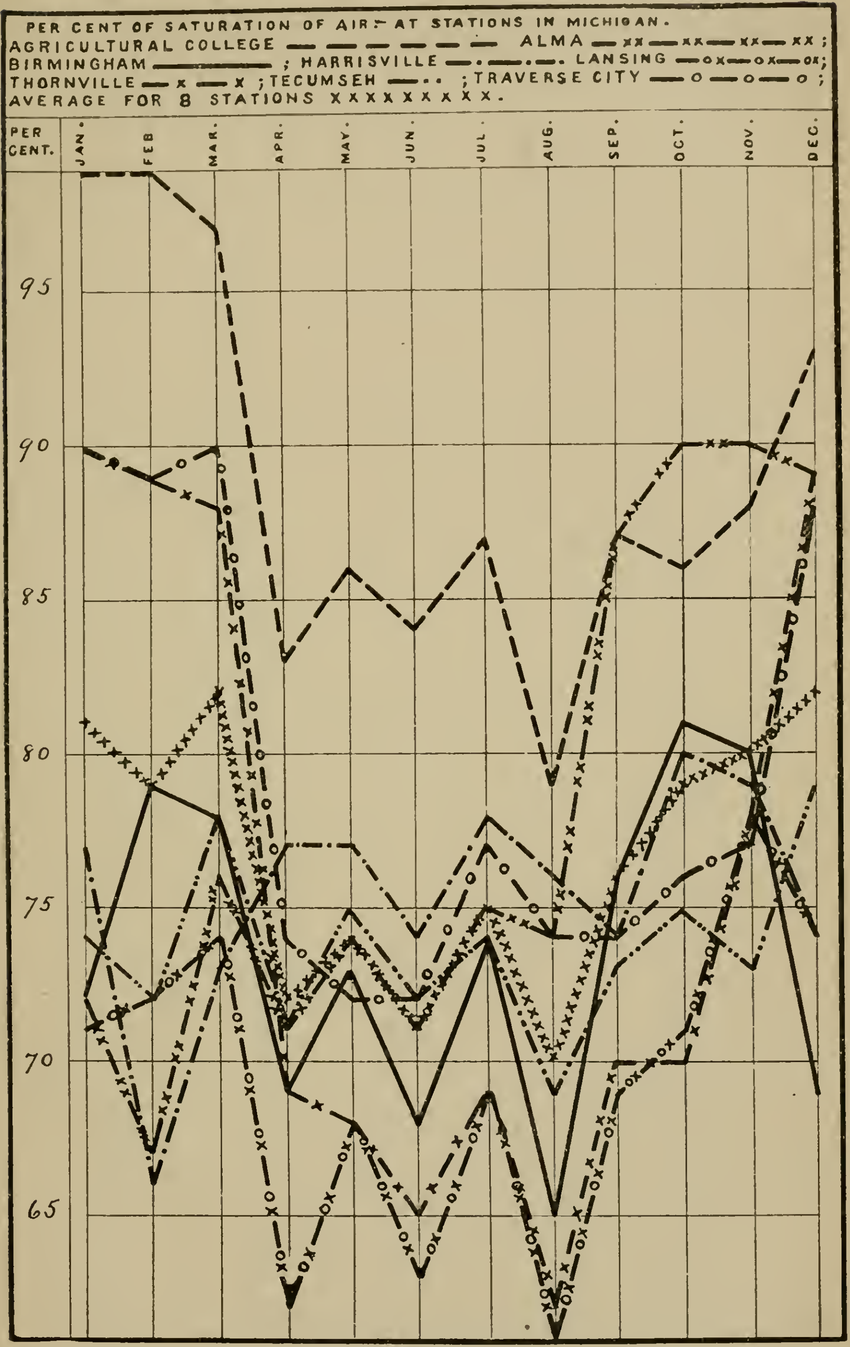
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 89 observations. c For 87 observations.
d For 86 observations. e For 82 observations. f For 81 observations.
g For 77 observations.

Note.—The observations in Table V were reduced by Guyot's table, in Smithsonian Meteorological Tables, or by a table substantially the same as that. Computations for Ann Arbor in 1899 were made by the observer there. All other computations in Table V were made at the office of the State Board of Health.

Graphic representations of nine representative lines in Table V are given in Diagram IV.

DIAGRAM IV.—RELATIVE HUMIDITY, BY MONTHS, 1899.



[PLATE 1042.]

Fogs.—For the year 1899, fog was reported at 65 morning observations, at 12 afternoon observations (at about 2 P. M.), at 24 evening observations (at about 9 P. M.), and 29 times during the day, no special time being mentioned, in many cases the same fog, or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at some time during the day, on 80 days.

EXHIBIT 16.—*Number of different days on which fog was observed at one or more of 13 stations in Michigan* in 1899, and each month of the year 1899.*

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
80	4	4	9	3	4	2	6	4	9	16	15	4

*This exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Rockland, Marquette, Harrisville, Traverse City, Grand Haven, Conklin, Thornville, Lansing, Ann Arbor, Battle Creek, Birmingham and Alma.

Exhibit 16, "Number of different days on which fog was observed," etc., supplies knowledge of the *time*, in each month, on which fog was observed, somewhere in Michigan. Exhibit 17, "Number of observations at which fog was observed," etc., supplies knowledge of the *time* combined with the *area* of the occurrences of fog. For the State as a whole, therefore, the last-mentioned exhibit supplies the most important information. Therefore, in this report the diagram relative to fog is made to exhibit the facts contained in this last-mentioned exhibit. Heretofore it has represented the "Number of different days on which fog was observed at one or more stations in Michigan."

EXHIBIT 17.—*Number of observations at which fog was observed in Michigan in 1899, and in each month of the year 1899. (Observations taken 3 times daily,* at 13 stations.)*†

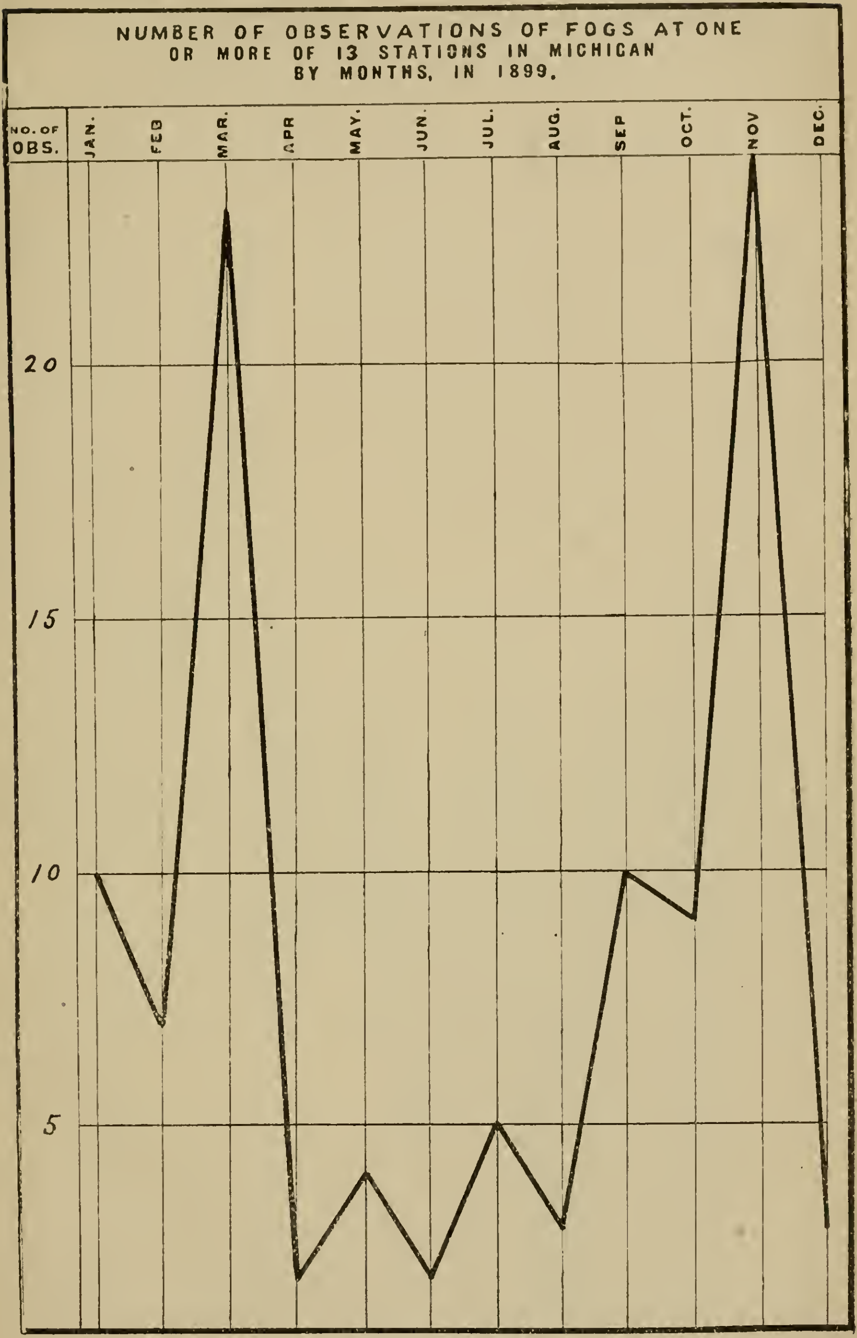
Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
101	10	7	23	2	4	1	5	3	10	9	24	3

*At the U. S. Weather Bureau Stations the observations were made at 8 A. M. and 8 P. M., 75th Meridian time.

†This exhibit contains statements only for those localities from which registers were received for every month of the year; the localities are stated in a foot-note to Exhibit 16 above.

Graphic representations of statements in Exhibit 17 are given in Diagram V.

DIAGRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1899.



[PLATE 1043.]

TABLE VI.—*Average per cent of cloudiness for months and year 1899, at 12 stations in Michigan; also average line for 10 stations. Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M., by observers* for the State Board of Health.*

Stations in Michigan.*	Divisions of the State.†	Average per cent of cloudiness.													
		Year.		Months, 1899.											
		Norm. ‡	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 10 stations§		......	53	63	55	73	47	51	35	47	31	52	43	68	69
Rockland	U. P.	......	¶	69[d]	53[m]	50[h]	45[i]	46[n]	.....	42[f]	56[c]	39	58[l]	.....	.....
Traverse City.....	N. W.	59^{18}	54	80	56	66	43[e]	44[d]	29[e]	46	36[j]	48[d]	51[c]	70[f]	82[a]
Harrisville........	N. E.	62^{15}	63	70	57	69[a]	66	59	57	55	45	66	60	81	74
Conklin...........	W.	......	‖	87	85	85	40	45	24	37	.....	47	57	38	76
Thornville	B. & E.	51^{23}	49	66	46	70[a]	39	51	30	39	28	47	39	63	65
Alma..............	C.	49^{2}	51	61	55	68	47	47	29	36[a]	20	43	51[a]	68	86
Agr'l College.....	C.	57^{36}	48	51	48	69	42	49	27	47	29	54	39	62	58
Lansing, S. B of H..............	C.	57^{21}	57	64	61	81	52	55	40	52	33	58	46	71	68
Ann Arbor.......	S. C.	56^{20}	56	61	57	79	49	53	39	52	40	57	45[a]	70[e]	69[a]
Battle Creek......	S. C.	......	44	53	56	67[b]	40[d]	47[f]	32[g]	39[a]	20	37	25	56[h]	57
Tecumseh.........	S. C.	......	48	56[c]	55[i]	80[e]	41	52	30	40[a]	23	49[e]	31	61[d]	62
Birmingham	S. E.	59^{13}	57	69[e]	59[k]	80	49[i]	57[b]	39[g]	59[h]	35[d]	56[d]	47	73[h]	65[c]

*The names of observers, their places of observation, and the counties in which these places are situated. are stated in Exhibit 1.

†The full names of divisions and the counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with December 31. 1899. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average.

§This line is an average for all the stations from which statements. nearly complete, were received for every month of the year. It does not include Rockland and Conklin.

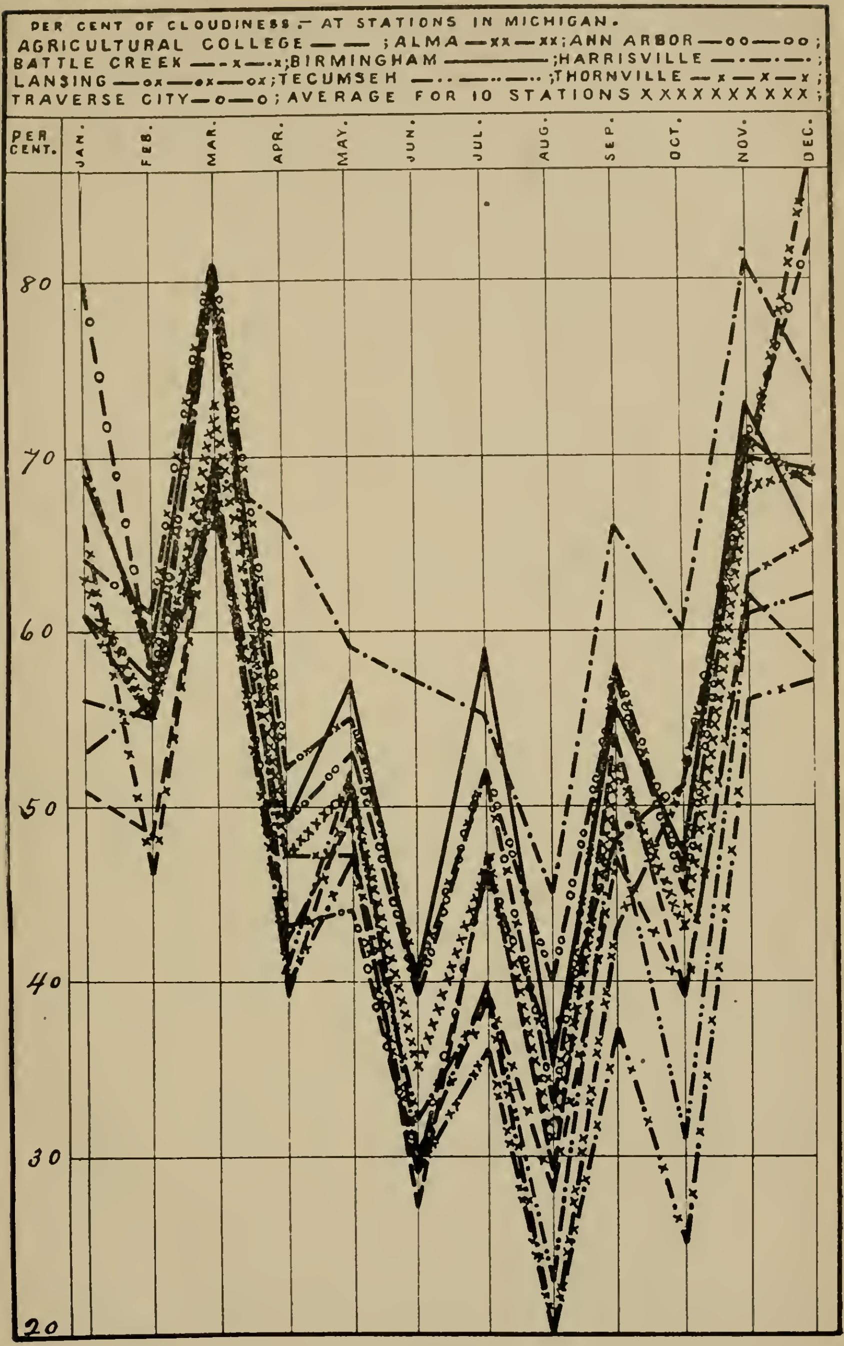
¶ The average for 9 months is 51. ‖ For 11 months 56.

a. b. c. In the columns from January to December, inclusive, the letters a, b. c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations. e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations. i For 83 observations. j For 78 observations. k For 77 observations. l For 76 observations. m For 75 observations. n For 70 observations.

Graphic representations of eleven representative lines in Table VI are given in Diagram VI.

DIAGRAM VI.—AV. PER CENT OF CLOUDINESS, BY MONTHS, 1899.



[PLATE 1044.]

EXHIBIT 18.—*Average per cent of cloudiness, by year and months, in 1899, compared with annual and monthly averages for 1898, and for 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Per cent of cloudiness.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98*	56	71	66	57	52	50	46	40	42	44	57	70	74
1898 (9 stations).....	57	71	78	57	51	50	42	29	47	39	71	69	77
1899 (10 stations)....	53	63	55	73	47	51	35	47	31	52	43	68	69
In 1899 greater than av. for 22 years, 1877–98.....	....	......	......	16	......	1	......	7	......	8	......	......	......
In 1899 less than av. for 22 years, 1877–98............	3	8	11	......	5	......	11	......	11	......	14	2	5
In 1899 greater than in 1898	....	......	......	16	......	1	......	18	......	13	......	......	......
In 1899 less than in 1898............	4	8	23	......	4	......	7	......	16	......	28	1	8

*At from 8 to 23 stations per year for the 22 years, 1877-98. Just which stations in each year, up to 1897, are shown on page 48, report for 1898.

EXHIBIT 19.—*Dates of auroras observed and recorded at 4 stations in Michigan during the year 1899.*

Stations.	Dates of auroras recorded in 1899.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Marquette..........	......	......	......	......	....	....	......	4	26	......	......	......
Thornville..........	28	......	......	......	2	....	......	......	......	......	......	......
Lansing.............	......	......	......	9	1	28, 29	......	......	26	......	......	......
Conklin.............	......	......	......	......	1, 3, 7, 9, 25	....	......	......	......	......	......	......

METEORS.—July 10, 1 meteor at 8:30 P. M., in S. E.; loud report and hissing noise—*Conklin.*

Dec. 31, 1 meteor at 8:50 P. M., in S. W.—*Lansing.*

EXHIBIT 20.—*Dates of solar and lunar halos recorded on the monthly registers in 1899.*

Line number.	Stations.	Dates of halos recorded, months, 1899.																								Line number.
		January.		February.		March.		April.		May.		June.		July.		August.		Septem'r.		October.		Novem'r.		December.		
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
1	Marquette......	....	....	....	....	....	....	1,9	22	....	....	....	....	....	....	....	....	23	....	....	......	....	......	......	....	1
2	Thornville	....	....	....	....	24	....	....	....	....	....	....	....	....	....	....	....	......	....	....	......	....	......	......	....	2
3	Lansing, S. B. of H.	2,15,16,22	19,25	6,14,21	16,17,20	1,5,6,24,26,27	20	9,12,20,22,27	22,25	1,3,8,15,26,30	15,19	27	....	1,12,14,31	....	2	....	2,11	....	10	13,14	7,8	7,16	4,6	14,16,17	3
4	Ann Arbor.....	....	....	....	16	....	....	....	....	....	....	....	....	....	....	....	....	......	16	....	17,20	....	16	......	....	4

Parhelia, May 11.—*Rockland.* Jan. 15, 16, 26, 27, Feb. 1, 6, 14, 17, 20, 27. Mar. 5, 20, 26, 30, 31, Apr. 9, May 8, Dec. 4, 31; Paraselene, Jan. 27; Lunar Corona, Feb. 17, Nov. 16, Dec. 20, 25.—*Lansing.*

EXHIBIT 21.—*Inches of rain and melted snow, by year and months in 1899, compared with annual and monthly averages for 1898, and for the 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Inches of rain and melted snow.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98	34.39	2.32	2.34	2.24	2.52	3.54	3.64	2.95	3.03	3.07	3.07	3.12	2.58
1898 (14 stations)....	33.19	3.09	2.43	3.27	1.65	2.44	3.87	1.39	3.21	2.85	4.41	2.56	2.02
1899 (15 stations)....	27.58	1.72	1.29	3.08	1.28	3.14	2.94	3.31	1.17	3.04	2.81	1.45	2.34
In 1899 **greater** than av. for 22 years, 1877-98.....	....	......	......	.84	......	......	......	.36	......	......	......	......	......
In 1899 **less** than av. for 22 years, 1877-98............	6.81	.60	1.05	......	1.24	.40	.70	......	1.86	.03	.26	1.67	.24
In 1899 **greater** than in 1898	....	......	......	......	......	.70	......	1.92	......	.19	......	......	.32
In 1899 **less** than in 1898............	5.61	1.37	1.14	.19	.37	......	.93	......	2.04	......	1.60	1.11	......

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*At from 12 to 23 stations per year for the twenty-two years, 1877-98. Just which stations in each year, up to 1897, are shown on page 50, report for 1898.

TABLE VII.—*Inches of rain and melted snow for months and year 1899, at 15 stations in Michigan; also average line for 15 stations,—as compiled from daily observations made by observers* for the State Board of Health, and for the U. S. Weather Bureau.*

Stations in Michigan.* (Those of the U. S. Weather Bureau in italics.)	Divisions of the State. †	Inches of rain and melted snow.													
		Year.		Months, 1899.											
		Norm. †	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 15 stations§	....	......	27.58	1.72	1.29	3.08	1.28	3.14	2.94	3.31	1.17	3.04	2.81	1.45	2.34
Marquette........	U. P.	31.50^{14}	36.43	1.64	0.53	2.79	2.60	4.74	4.69	2.82	4.29	3.90	3.46	0.56	4.41
Sault Ste. Marie.	U. P.	33.51^{8}	30.68	1.61	1.10	1.44	1.85	4.09	4.14	2.90	2.81	4.47	2.22	0.97	3.08
Traverse City.....	N. W.	36.85^{18}	31.08	1.93	0.93	3.30	1.84	1.77	5.73	5.37	0.87	3.29	2.41	0.58	3.06
Alpena...........	N. E.	34.68^{27}	29.93	0.88	0.47	2.39	2.01	2.55	6.22	6.58	0.83	2.69	2.78	0.59	1.94
Harrisville........	N. E.	33.76^{13}	32.13	1.21	1.37	4.01	0.86	2.40	4.99	6.97	1.64	2.97	3.65	0.57	1.49
Grand Haven....	W.	34.13^{9}	27.98	2.01	1.13	2.19	2.02	4.09	1.04	3.57	0.38	4.06	2.57	1.58	3.34
Port Huron......	B. & E.	31.51^{25}	25.85	2.02	0.95	2.93	0.77	2.14	2.15	1.92	0.31	4.73	4.15	1.43	2.35
Thornville........	B. & E.	32.09^{23}	27.57	2.66	1.64	4.18	0.67	2.28	1.65	2.67	2.38	2.82	3.16	1.40	2.06
Agr'l College.....	C.	30.81^{36}	24.73	2.16	1.51	3.88	1.56	3.59	1.15	2.11	0.70	2.14	2.68	1.72	1.53
Lansing, S. B. of H..............	C.	32.64^{20}	25.00	2.05	1.65	3.17	1.93	3.28	1.15	2.62	0.33	2.24	3.11	1.86	1.61
Ann Arbor........	S. C.	29.68^{12}	24.83	1.39	1.51	2.55	0.21	4.40	2.49	1.92	0.51	2.68	3.01	1.99	2.17
Battle Creek......	S. C.	......	17.62	1.94	1.13	1.71	1.23	2.21	2.35	1.58	0.79	1.68	0.82	1.58	0.60
Tecumseh.........	S. C.	......	31.74	1.17	2.16	4.48	0.55	4.07	3.44	3.47	1.05	3.10	3.20	2.48	2.57
Birmingham......	S. E.	29.65^{13}	21.73	1.34	1.13	2.76	0.64	2.11	1.16	2.25	0.07	2.62	2.63	2.46	2.56
Detroit..........	S. E.	32.45^{28}	26.41	1.75	2.12	4.36	0.53	3.38	1.82	2.95	0.62	2.18	2.35	2.05	2.30

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*The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1.

†The names of divisions, and the counties in each, are stated in Exhibit I, in preceding reports.

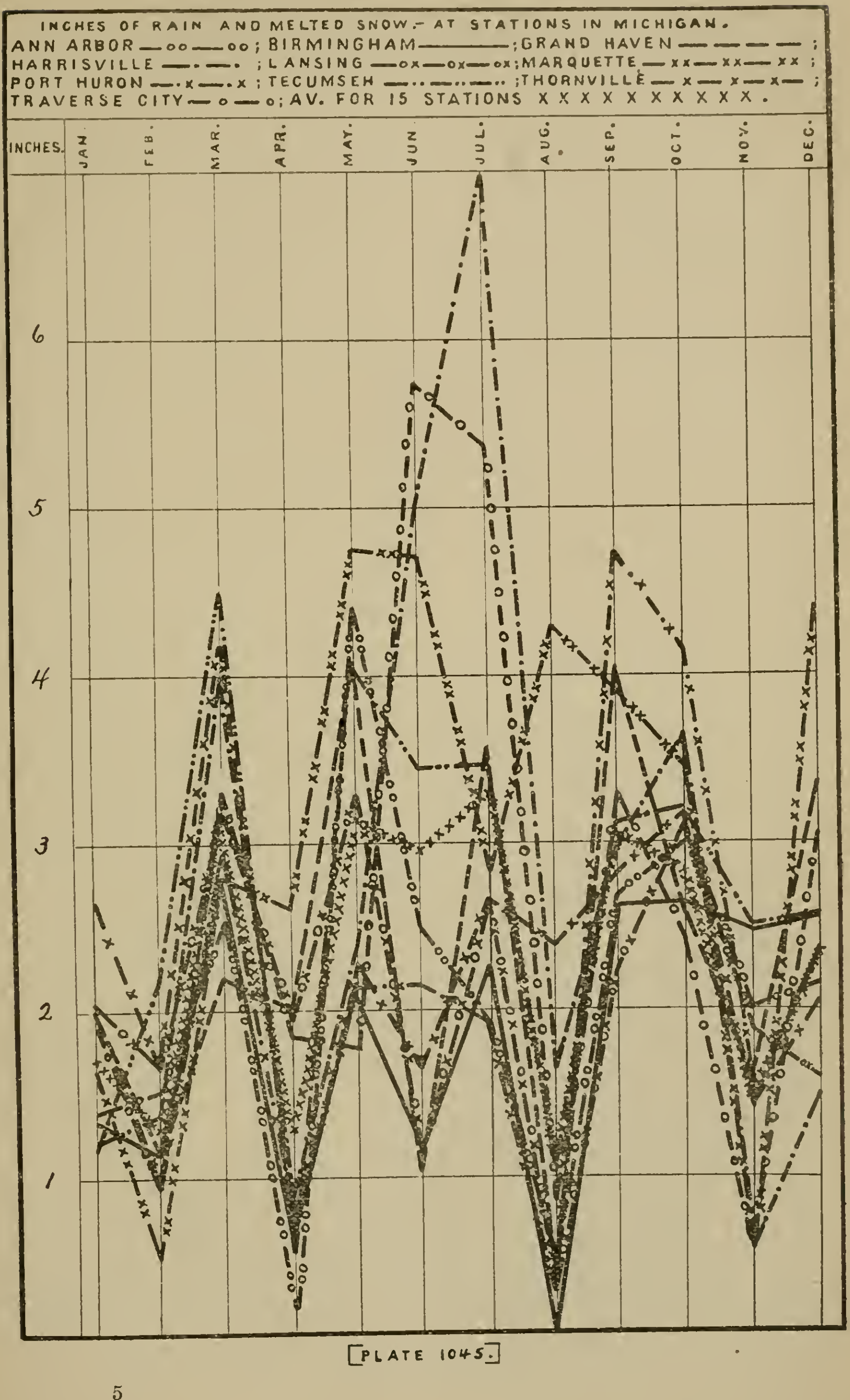
‡Numbers in this column state the annual average rainfall for periods of years ending in each case with December 31, 1899. The small figures above and at the right of numbers which state the rainfall denote the number of years included in the average.

§This line is an average for all the stations, from which statements are given for every month of the year.

NOTE.—The computations of amount of rainfall were furnished by the observers at Detroit, Alpena, Grand Haven, Port Huron, Ann Arbor, Sault Ste. Marie, Marquette, and the Agricultural College for the year. All other computations in Table VII were made in the office of the Secretary of the State Board of Health.

The average line and lines for ten representative stations in Table VII are graphically represented in Diagram VII.

DIAGRAM VII.—RAINFALL, BY MONTHS, 1899.



[PLATE 1045.]

TABLE VIII.—*Relative amount of ozone in the atmosphere by day, for months and year 1899, at 13 stations, also average lines for 9 stations and for 2 stations in Michigan, as indicated by averages of observations made daily by exposing test-paper prepared according to Schonbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 degrees of coloration of the test-paper (greatest coloration by ozone equals 10) by observers for the State Board of Health, and for the U. S. Weather Bureau.**

Stations in Michigan.† (Those of the U. S. Weather Bureau in italics.)	Divisions of the State. †	Degrees of coloration of test-paper—Day observations.**													
		Year.		Months, 1899.											
		Norm. ‡	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov. [i]	Dec.
Av. for 9 stations§	....	......	3.04	3.65	3.36	3.95	3.34	3.61	2.94	2.46	3.01	2.55	2.28	2.56	2.81
Av. for 2 stations‖	....	......	1.46	1.85	1.97	1.32	1.69	1.77	1.92	0.99	1.86	0.76	0.79	1.28	1.37
Rockland.........	U. P.	......	¶	[b] 7.18	[d] 6.21	[b] 5.06	[c] 5.87	[f] 5.26	.....	[e] 6.08	[b] 6.84	4.21	[f] 6.07	.....	.....
Traverse City	N. W.	5.27 ^{18}	6.18	6.38	6.26	6.31	6.34	6.60	6.40	6.24	[e] 6.84	5.98	5.82	5.51	5.47
Harrisville.......	N. E.	3.58 ^{15}	2.43	3.64	2.79	2.70	2.07	2.22	2.37	1.75	2.53	2.01	2.34	2.41	2.31
Conklin	W.	......	††	.....	.....	2.86	1.27	1.57	1.47	1.85	2.53	2.14	2.50	2.38	2.12
Grand Haven...	W.	......	2.00	2.80	3.15	2.20	2.50	2.09	2.14	1.38	2.21	0.98	1.10	1.35	2.13
Port Huron	B. & E.	......	0.92	0.89	0.79	0.43	0.87	1.44	1.70	0.59	1.50	0.53	0.47	1.21	0.60
Thornville	B. & E.	3.19 ^{23}	3.61	5.54	5.36	5.95	3.90	3.12	1.44	1.56	1.69	2.88	3.05	4.68	4.18
Alma.............	C.	2.58 ^{2}	2.62	4.76	3.79	3.37	2.60	2.99	2.10	2.59	3.02	1.44	1.76	1.78	1.28
Lansing, S. B. of H..........	C.	2.98 ^{21}	2.21	2.28	2.22	2.89	2.70	3.02	2.84	2.50	2.50	2.08	1.05	0.48	1.92
Ann Arbor.......	S. C.	2.72 ^{7}	2.96	2.70	2.58	4.47	4.94	5.28	4.04	1.33	2.69	2.18	1.56	1.58	2.15
Battle Creek......	S. C.	......	1.44	1.89	1.68	3.15	2.04	1.95	1.07	0.50	1.40	0.67	0.79	0.78	1.41
Tecumseh........	S. C.	......	3.57	3.54	3.33	4.02	3.80	4.73	3.97	3.56	4.05	3.31	1.98	3.15	3.44
Birmingham	S. E.	2.39 ^{2}	2.35	2.15	2.22	[a] 2.70	1.67	2.60	2.21	2.08	2.40	[b] 2.38	[a] 2.04	2.65	3.11

*At the stations of the U. S. Weather Bureau during the year 1899, the observations were made by exposing the test-paper from 8 A. M. to 8 P. M., all 75th Meridian time. The corresponding local time for some of these stations is stated in a foot-note to Table II.

†The names of observers, their places of observation and the counties in which these places are situated, are stated in Exhibit 1. The full names of the divisions and counties in each division are stated in Exhibit I, in preceding reports.

‡Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with December 31, 1899. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

§This line is an average for only the stations from which statements nearly complete were received for every month in the year. It does not include Rockland, Conklin and the Weather Bureau Stations.

‖This is an average line for Grand Haven and Port Huron.

¶The average for 9 months is 5.86. ††For 10 months, 2.08.

**Allowance made for difference in sensitiveness of test-paper; explained below, "i."

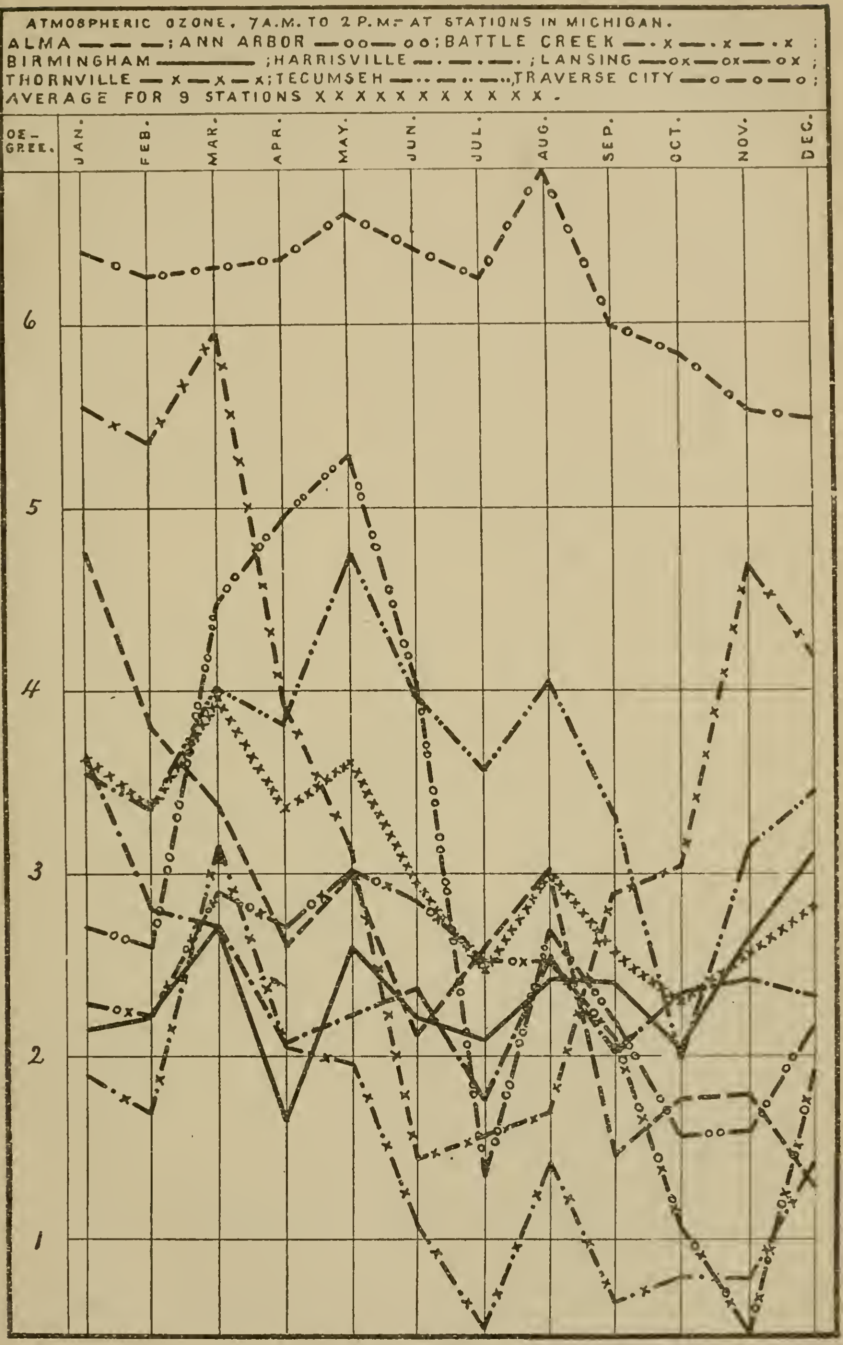
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 23 days.

i Concerning Ozone Corrections.—It is now believed that the correction (for variation in sensitiveness of different lots of test-paper) applied to the monthly averages in the tables for the day and the night ozone, for the month of November in each of the years 1891, 1892 and 1893, at stations in Michigan and at Lansing, was .39 too great for the day (7 A. M. to 2 P. M.) and .54 for the night ozone (9 P. M. to 7 A. M.). This should be taken into consideration in studying the tables relative to ozone in the annual reports of this board for those years.

Ten lines in this table are represented in Diagram VIII.

DIAGRAM VIII—OZONE, AV. BY DAY, MONTHS IN 1899.



[PLATE 1046.]

TABLE IX.—*Relative amount of ozone in the atmosphere at night for months and year 1899, at 13 stations, also average line for 9 stations and for 2 stations in Michigan—as indicated by averages of observations made nightly by exposing test-paper, prepared according to Schonbein's formula, from 9 P. M. to 7 A. M.—Recorded according to a scale of 10 degrees of coloration of the test-paper (greatest coloration by ozone equals 10) by observers for the State Board of Health, and for the U. S. Weather Bureau.**

Stations in Michigan.† (Those of the U. S. Weather Bureau in italics.)	Divisions of the State. ‡	Degrees of coloration of test-paper.—Night observations.**													
		Year.		Months, 1899.											
		Norm. §	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations‖	....	......	3.49	3.50	3,80	4.58	3.99	4.21	3.58	3.05	3.44	2.93	2.67	2.91	3.20
Av. for 2 stations¶	....	......	1.96	2.14	2.38	1.56	2.07	2.59	2.24	2.10	2.49	1.35	1.10	1.57	1.98
Rockland	U. P.	......	††	[b] 7.03	[d] 7.08	[c] 6.87	[e] 5.93	[g] 5.76	.....	[f] 7.24	[a] 7.60	6.28	[h] 6,95	.....	.....
Traverse City.....	N. W.	5.22 ^{18}	5.96	6.02	6.51	5.88	6.54	6.64	6.68	5.55	[d] 5.67	6.11	4.85	[c] 5.27	5.78
Harrisville........	N. E.	4.06 ^{15}	2.72	3.05	3.15	3.28	3.14	2.57	2.54	2.32	2.78	2.24	2.49	2.56	2.52
Conklin...........	W.	......	‡‡	.....	.....	2.73	2.64	1.61	1.61	2.38	2.68	2.34	2.85	2.53	2.52
Grand Haven....	W.	......	2.80	3.39	3.49	2.29	3.14	3.32	2.63	3.27	3.46	1.88	1.57	1.83	3.35
Port Huron......	B. & E.	......	1.12	0.89	1.26	0.83	1.00	1.86	1.84	0.93	1.52	0.81	0.62	1.30	0.60
Thornville	B. & E.	4.02 ^{23}	4.92	5.54	7.51	7.89	5.67	4.80	2.71	2.90	3.01	3.94	4.04	5.53	5.52
Alma..............	C.	3.05 ^{2}	2.81	4.76	3.26	3.92	3.74	2.86	1.91	2.80	3.36	1.77	1.78	1.93	1.58
Lansing, S. B. of H............	C.	3.32 ^{21}	2.56	1.83	2.37	3.50	3.07	3.90	4.04	2.58	2.56	2.24	1.14	1.00	2.54
Ann Arbor........	S. C.	2.62 ^{7}	3.40	2.70	2.58	5.02	4.40	4.96	3.98	2.51	3.81	2.88	3.17	2.76	1.97
Battle Creek......	S. C.	......	2.15	1.89	2.29	3.79	2.74	4.15	3.58	1.64	2.49	0.41	0.65	0.53	1.58
Tecumseh	S. C.	......	4.42	3.54	4.15	5.05	4.84	5.35	4.54	4.42	4.91	4.21	3.75	3.93	4.31
Birmingham	S. E.	2.50 ^{2}	2.46	2.15	2.40	[a] 2.87	1.80	2.64	2.28	2.71	2.36	[b] 2.58	[a] 2.13	2.66	2.99

*At the U. S. Weather Bureau Stations during the year 1899 the observations were made by exposing the test-paper from 8 P. M. to 8 A. M., 75th Meridian time. The corresponding local time for some of these stations is stated in a foot-note to Table II.

†The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1.

‡The full names of the divisions and the counties in each division are stated in Exhibit I, in preceding reports.

§Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with December 31, 1899. The small figures above and at the right of the numbers which state the average denote the number of years included in the average.

‖This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Tecumseh and the U. S. Weather Bureau Stations.

¶This is an average line for Grand Haven and Port Huron.

**Allowance has been made for difference in sensitiveness in test-paper; explained in foot-note "i," Table VIII.

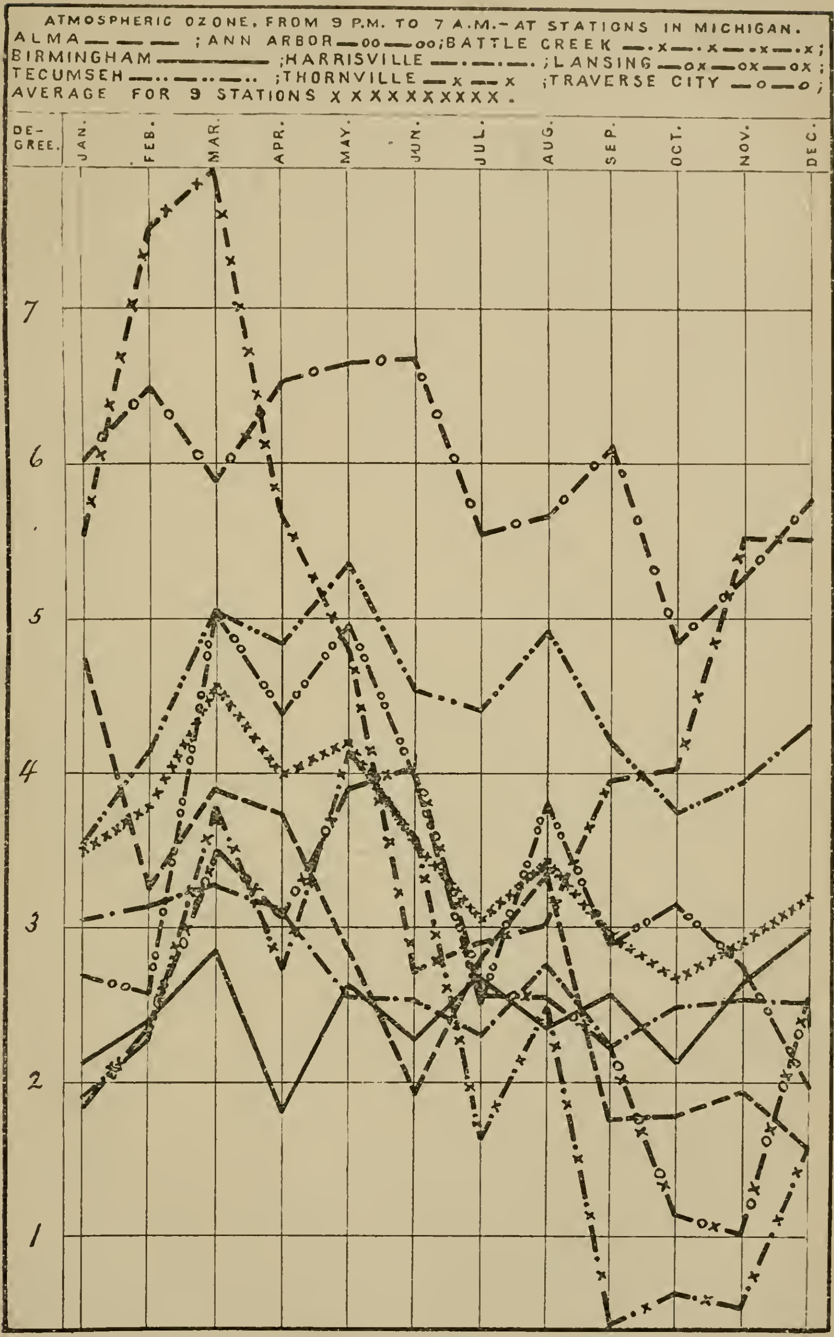
††The average for 9 months is 6.75. ‡‡For 10 months, 2.39.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 24 days. g For 23 days. h For 17 days.

Ten lines in this table are graphically represented in Diagram IX.

DIAGRAM IX.—OZONE, AV. BY NIGHT, MONTHS IN 1899.



[PLATE 1047.]

EXHIBIT 22.—*Average amount of atmospheric ozone (day), by year and months, in 1899, compared with annual and monthly averages for 1898, and for the 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Ozone by day.—Degrees of coloration of test-paper.†												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98	3.48	3.71	3.83	3.84	3.61	3.73	3.47	3.02	3.47	3.13	3.19	3.23	3.53
1898 (8 stations)....	3.57	3.86	4.19	4.04	3.20	3.70	3.12	2.65	3.85	3.16	3.60	3.30	4.14
1899 (9 stations).....	3.04	3.65	3.36	3.95	3.34	3.61	2.94	2.46	3.01	2.55	2.28	2.56	2.81
In 1899 **greater** than av. for 22 years, 1877-98......	......	......	......	.11	......	......	......	......	......	......	......	......	......
In 1899 **less** than av. for 22 years, 1877-98............	.44	.06	.47	......	.27	.12	.53	.56	.46	.58	.91	.67	.72
In 1899 **greater** than in 1898.......	......	......	......	......	.14	......	......	......	......	......	......	......	......
In 1899 **less** than in 1898...............	.53	.21	.83	.09	......	.09	.18	.19	.84	.61	1.32	.74	1.33

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*At from 6 to 20 stations per year for the 22 years, 1877-98. Just which stations in each year, up to 1897, are shown on page 58, report for 1898.

†In this exhibit allowance has been made for difference in sensitiveness of different lots of test-paper.

EXHIBIT 23.—*Average amount of atmospheric ozone (night), by year and months, in 1899, compared with annual and monthly averages for 1898, and for the 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Ozone by night.—Degrees of coloration of test-paper.†												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98	3.69	3.98	4.33	4.29	4.01	3.98	3.70	3.09	3.35	3.02	3.33	3.50	3.93
1898 (8 stations).....	3.94	3.91	4.60	4.21	3.83	4.05	3.59	3.15	4.42	3.29	4.12	3.70	4.43
1899 (9 stations).....	3.49	3.50	3.80	4.58	3.99	4.21	3.58	3.05	3.44	2.93	2.67	2.91	3.20
In 1899 **greater** than av. for 22 years, 1877-98......	......	......	......	.29	......	.23	......	......	.09	......	......	......	......
In 1899 **less** than av. for 22 years, 1877-98............	.20	.48	.53	.....	.02	......	.12	.04	......	.09	.66	.59	.73
In 1899 **greater** than in 1898.......	......	......	......	.37	.16	.16	......	......	......	......	......	......	......
In 1899 **less** than in 1898.............	.45	.41	.80	......	......	......	.01	.10	.98	.36	1.45	.79	1.23

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*At from 6 to 20 stations per year for the 22 years, 1877-98. Just which stations in each year, up to 1897, are shown on page 58, report for 1898.

†In this exhibit allowance has been made for difference in sensitiveness of different lots of test-paper.

OBSERVATIONS FOR OZONE AT LANSING.—Since July 1, 1884, the observations for ozone at Lansing have been taken at the new shelter for meteorological instruments in the southwest part of the Capitol yard. Previous to July 1, 1884, the observations had been taken at the office window. Exhibit E, page 60, of the Report for 1885, shows that the average for the month for July, 1884, is greater at each observation—7 A. M. to 2 P. M., 2 P. M. to 9 P. M., and 9 P. M. to 7 A. M., at the shelter for instruments than at the office window. Possibly this fact should be taken into consideration in studying ozone at Lansing through a long period of years.

EXHIBIT 24.—*Average velocity of the wind in miles per hour, by year and months in 1899, compared with annual and monthly averages for 1898, and for the 17 years, 1882-98.* From registers of the Robinson self-registering anemometer.† These averages are for groups of several stations in Michigan.*

Years, etc.	Average miles per hour.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 17 years, 1882-98*	9.7	10.8	10.9	10.8	10.4	9.5	7.9	7.8	7.6	8.7	9.6	10.9	11.0
1898 (7 stations).....	9.7	10.8	11.1	10.3	10.0	9.1	8.3	7.3	7.0	8.6	10.2	11.5	12.2
1899 (8 stations).....	9.3	11.9	9.3	11.2	9.3	9.2	8.9	7.4	7.3	8.9	8.4	8.3	11.9
In 1899 greater than av. for 17 years, 1882-98......	....	1.1	......	.4	......	......	1.0	......	......	.2	......	......	.9
In 1899 less than av. for 17 years, 1882-98............	.4	......	1.6	......	1.1	.3	......	.4	.3	......	1.2	2.6	......
In 1899 greater than in 1898.......	....	1.1	......	.9	......	.1	.6	.1	.3	.3	......	......	......
In 1899 less than in 1898................	.4	......	1.8	......	.7	......	......	......	......	......	1.8	3.2	.3

*At from 6 to 9 stations per year for the 17 years, 1882-98.
†Gibbon's anemometer was used at Ann Arbor.

EXHIBIT 25.—*Average velocity of the wind in miles per hour, by months for the 19 years, 1880-98, and comparisons of 1899 with this average and with the year 1898. From registers of the Robinson self-registering anemometer in the office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Miles by self-regestering anemometer.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 19 years, 1880-98	9.8	11.0	11.6	11.3	11.1	9.6	8.3	7.7	7.2	8.4	9.1	11.1	11.1
1898................	9.7	11.1	11.0	10.8	10.0	8.5	8.4	6.7	6.8	7.9	9.5	12.6	12.7
1899................	9.1	12.1	9.1	11.8	9.7	8.2	8.6	7.7	6.8	8.1	7.5	7.6	11.8
In 1899 greater than av. for 19 years, 1880-98.....	....	1.1	......	.5	......	......	.3	0	......	......	......	......	.7
In 1899 less than av. for 19 years, 1880-98...........	.7	......	2.5	......	1.4	1.4	......	......	.4	.3	1.6	3.5	......
In 1899 greater than in 1898	....	1.0	......	1.0	.....	......	.2	1.0	0	.2	......	......	......
In 1899 less than in 1898...........	.6	......	1.9	.....	.3	.3	......	......	......	......	2.0	5.0	.9

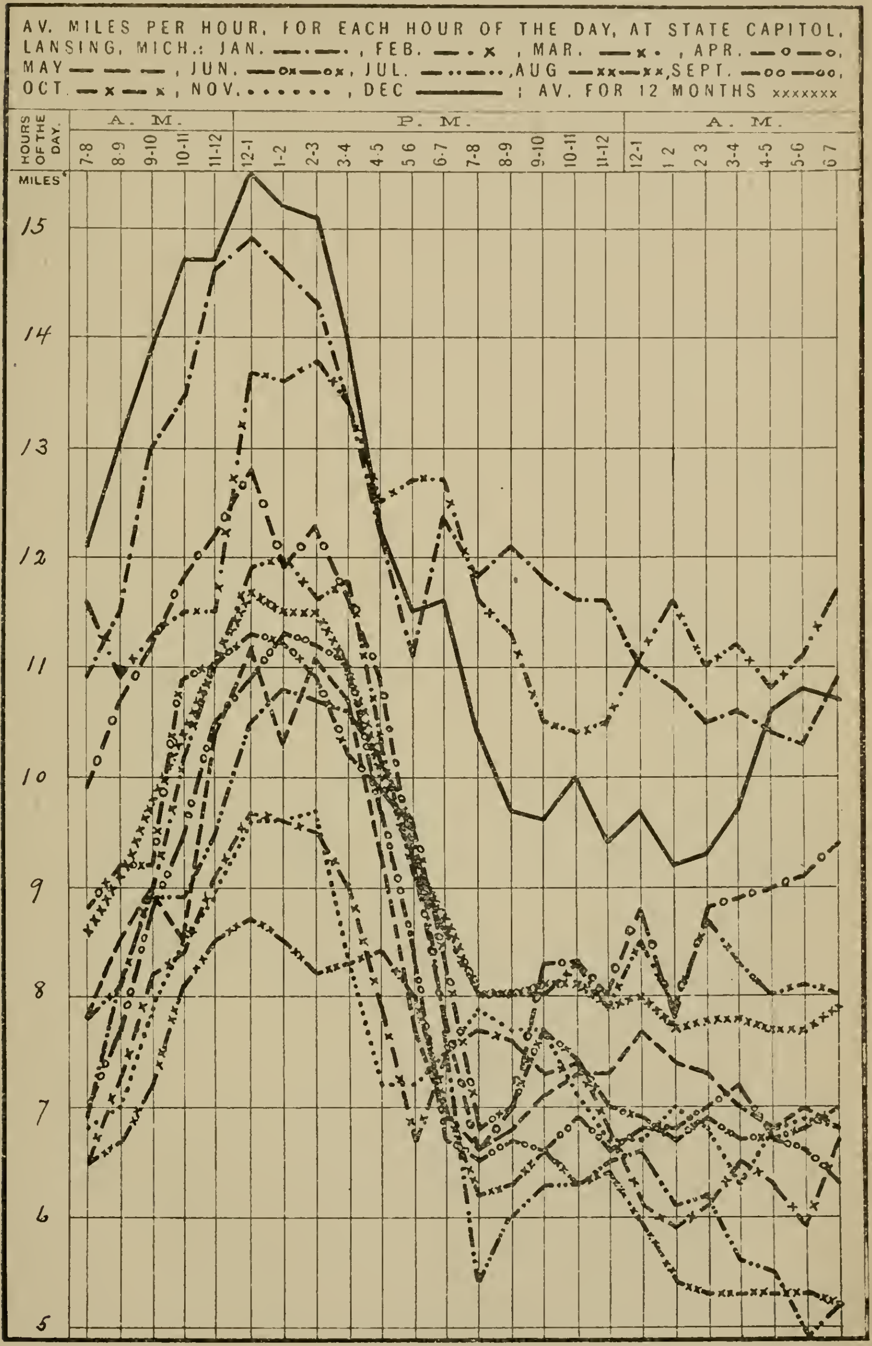
TABLE X.—*Average velocity of the wind in miles per hour for each hour of the day, by months of the year 1899. Compiled from registers of the Robinson self-registering anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Mich.*

Months.	Averages.			Hours (1899) and average miles per hour.																							
	Av. 20 years, 1880-99.	1898.	1899.	A. M.					P. M.												A. M.						
				7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year	9.8	9.7	9.1	8.6	9.1	9.8	10.4	11.0	11.7	11.5	11.5	11.0	10.1	9.2	8.7	8.0	8.0	8.1	8.1	7.9	8.0	7.7	7.8	7.8	7.7	7.7	7.9
January	11.1	11.1	*12.1	10.9	11.5	13.0	13.5	14.6	14.9	14.6	14.3	13.4	12.2	11.1	12.4	11.8	12.1	11.8	11.6	11.6	11.0	10.8	10.5	10.6	10.4	10.3	10.9
February	11.4	11.0	9.2	7.8	8.1	9.0	10.2	11.0	11.9	12.0	11.6	11.8	10.3	9.1	8.6	8.0	8.0	8.0	8.3	7.9	8.5	7.9	8.7	8.3	8.0	8.1	8.0
March	11.3	10.8	11.8	11.6	10.9	11.3	11.5	11.5	13.7	13.6	13.8	13.4	12.5	12.7	12.7	11.6	11.3	10.5	10.4	10.5	11.1	11.6	11.0	11.2	10.8	11.1	11.7
April	11.0	10.0	†9.6	9.9	10.7	11.2	11.8	12.2	12.8	11.9	12.3	11.6	10.9	9.2	7.8	6.6	7.0	8.3	8.3	8.0	8.8	7.8	8.8	8.9	9.0	9.1	9.4
May	9.6	8.5	8.2	7.8	8.5	9.0	8.5	10.4	11.2	10.3	11.1	10.7	9.3	7.7	7.0	6.6	6.8	7.1	7.3	7.3	7.7	7.4	7.3	7.0	6.8	7.0	6.8
June	8.3	8.4	‡8.5	8.8	9.2	9.2	10.9	11.0	11.3	11.2	10.9	10.2	9.9	9.5	8.3	6.8	7.0	7.7	7.4	7.0	6.9	6.7	6.9	6.7	6.7	6.8	7.0
July	7.7	6.7	§7.7	6.9	8.1	8.9	8.9	9.5	10.5	10.8	10.7	10.6	10.2	9.6	7.7	5.4	6.0	6.3	6.3	6.5	6.6	6.1	6.2	5.6	5.5	4.9	5.2
August	7.2	6.8	6.8	6.5	6.7	7.2	8.1	8.5	8.7	8.5	8.2	8.3	8.4	8.0	7.0	6.2	6.3	6.6	6.3	6.4	5.9	5.4	5.3	5.3	5.3	5.3	5.2
September	8.4	7.9	8.1	7.0	7.7	8.8	9.5	10.5	10.9	11.3	11.2	11.0	9.7	8.4	6.7	6.5	6.7	6.6	6.9	6.6	6.8	6.8	7.0	7.2	6.7	6.6	6.3
October	9.0	9.5	§7.5	6.5	7.3	8.2	8.4	9.1	9.7	9.6	9.5	9.0	7.9	6.7	7.5	7.7	7.6	7.3	7.4	6.8	6.1	5.9	6.1	6.5	6.3	5.9	6.7
November	10.9	12.6	7.6	6.8	7.0	7.9	8.5	8.9	9.6	9.6	9.7	8.3	7.2	7.2	7.5	7.9	7.7	7.7	7.1	6.7	6.7	7.0	6.8	6.3	6.8	6.9	6.8
December	11.1	12.7	*11.8	12.1	13.1	13.9	14.7	14.7	15.5	15.2	15.1	14.0	12.2	11.5	11.6	10.4	9.7	9.6	10.0	9.4	9.7	9.2	9.3	9.7	10.6	10.8	10.7

*For only about 30 days. †For only about 26 days. ‡For only about 28 days. §For only about 29 days.

The statements in the third figure column in Table X, of the average velocity of the wind in miles per hour, by months, during the year 1899, are graphically represented in Diagram XI. The remaining columns of Table X, for 1899, are graphically represented in Diagram X.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS, 1899.



[PLATE 1048.]

TABLE XI.—*Average velocity of the wind in miles per hour for the year and for each month of the year 1899, at 8 stations in Michigan; also average for 8 stations. Computed from registers of the Robinson self-registering anemometer,* by observers for the State Board of Health, and for the U. S. Weather Bureau.*

Stations in Michigan.†	Divisions of the State.	Miles, by self-registering anemometer. Year. Norm. ‡	Year. 1899.	Months, 1899. Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations	....	......	9.3	12.1	9.3	11.2	9.3	9.2	8.9	7.4	7.3	8.9	8.4	8.3	11.9
Marquette........	U. P.	9.7^{14}	9.8	12.1	8.9	9.0	8.9	9.4	9.4	7.8	8.4	10.9	10.5	9.2	12.8
Sault Ste. Marie..	U. P.	8.7^{8}	8.8	8.5	7.6	11.4	9.2	10.5	8.4	8.1	6.8	9.5	8.0	7.9	9.9
Alpena...........	N. E.	......	9.0	10.7	8.1	11.2	8.7	10.0	9.1	6.3	7.7	7.8	8.5	8.0	11.9
Grand Haven.....	W.	10.5^{10}	9.8	14.1	9.7	11.2	10.2	9.1	9.5	7.1	6.6	8.9	9.0	8.1	13.7
Port Huron.......	B. & E.	10.7^{18}	11.0	14.1	11.6	13.7	10.7	10.3	10.1	9.0	9.1	10.7	9.6	10.3	13.1
Lansing, S. B. of H..............	C.	9.7^{20}	9.1	12.1	9.1	11.8	9.7	8.2	8.6	7.7	6.8	8.1	7.5	7.6	11.8
Ann Arbor.......	S. C.	7.9^{4}	7.5	11.8	8.4	9.6	7.5	6.4	6.5	5.4	5.2	6.3	5.8	7.2	9.3
Detroit...........	S. E.	9.9^{18}	9.8	13.1	11.0	11.5	9.7	9.3	9.4	7.6	7.6	9.1	8.1	8.2	12.6

*Gibbon's anemometer was used at Ann Arbor.

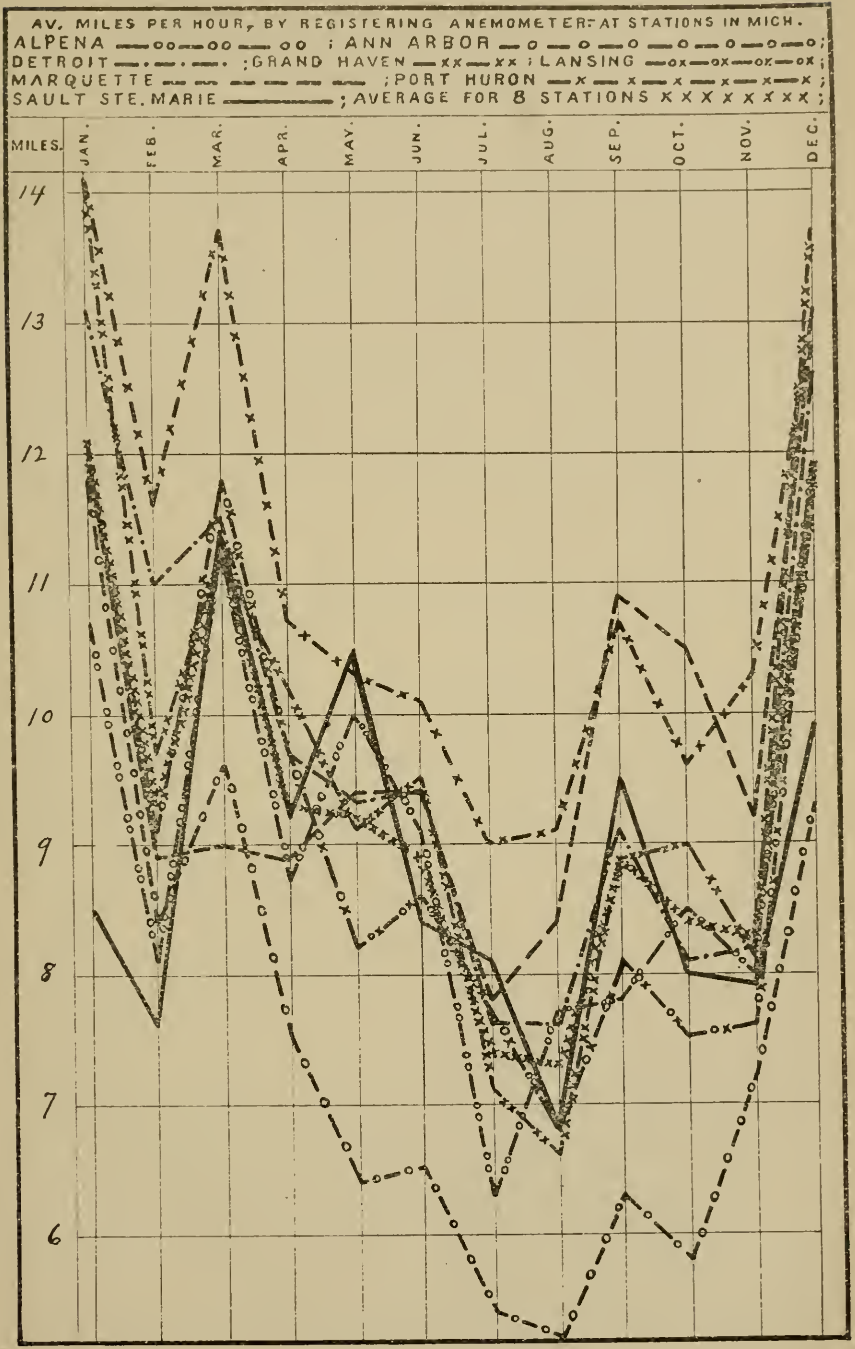
†The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

‡Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with December 31, 1899. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

Graphic representations of statements made in Table XI are given in Diagram XI.

Diagrams relating to meteorological conditions.—Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of the month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus in Diagram I, relating to average temperature in 1899, tracing the line "— - —" representing Harrisville, it may be seen that the average temperature at Harrisville was, in January, about 19°, in May about 52°, in August about 67°, in December about 25°, etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average lines given in each table are represented in the corresponding diagram by an × line, thus × × × ×. The lines in the diagrams give more ready general comparisons of stations with each other, or of months, with each other, than is possible from the mere numerical statements. By Diagram II, it appears at a glance that the average daily range of temperature at Birmingham in 1899 was, during August, greater than at any other of the ten stations represented in that diagram, and during December was less at Thornville. The marked agree-

DIAGRAM XI.- VELOCITY OF WIND, BY MONTHS, 1899.



[PLATE 1049.]

ment in the course of lines in Diagram I, representing mean monthly temperature at eight stations, and also that the agreement is closer in November and December than in the other months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I, relating to mean temperature by months in 1899, and those in Diagram III, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 12 M. and 2 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1899 at Lansing, the months of most wind were January, March and December. By reference to Diagram XI, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, January was in 1899 the month of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams.

Diagrams XII, XIII, XIV and XV, relating to the direction of the wind, are constructed on a plan different from that of the other diagrams. A description of the plan of their construction, method of reading, etc., is printed on page 62 of the annual report for 1898, and in preceding reports.

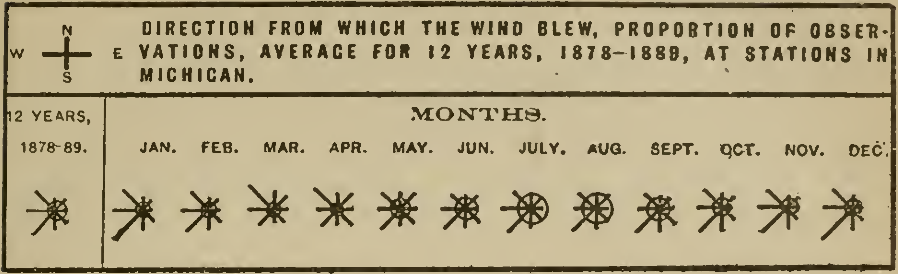
EXHIBIT 26.—Direction of Wind, 1878-89.—*Number of observations per month (made tri-daily), at which the wind was blowing from the several (eight) points of compass.—Annual and monthly averages for the 12 years, 1878-89, at stations in Michigan.**

Points of compass.	Average number of observations per month—12 years, 1878-89.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations...	91	93	85	93	90	93	90	93	93	89	92	90	93
Calm	5	4	4	4	4	5	6	8	8	6	5	4	4
North	7	6	6	10	9	8	7	8	8	6	8	6	6
Northeast..........	8	6	7	10	11	11	9	8	10	7	8	7	5
East.................	6	5	6	7	8	8	6	5	6	6	5	5	5
Southeast..........	9	9	9	9	11	11	10	8	9	11	9	7	8
South...............	10	11	10	7	8	10	11	10	10	12	12	11	11
Southwest..........	17	22	16	12	12	15	16	18	17	18	18	19	23
West................	14	16	14	14	11	12	13	16	12	12	13	17	17
Northwest..........	14	15	13	19	16	13	11	13	13	12	14	15	14

*At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883; 21 in 1884; 21 in 1885; 16 in 1886; 17 in 1887; 13 in 1888, and 11 in 1889.

Graphic representations of statements made in Exhibit 26, are given in Diagram XIII.

DIAGRAM XIII.—WIND, DIRECTION, IN MICH., AVERAGE 12 YEARS, 1878—1889.



*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION
[Plate 675.]

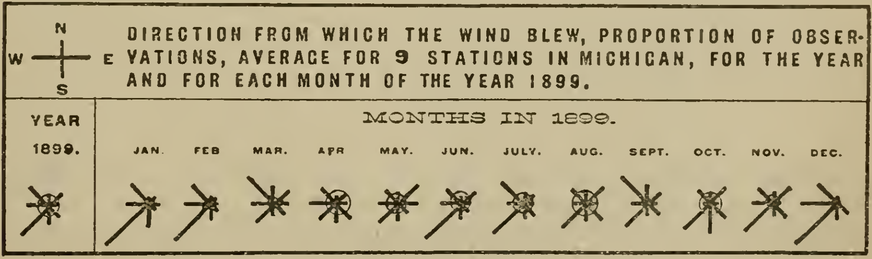
TABLE XII.—*Number of observations per month (at 7 A. M., 2 P. M. and 9 P. M., daily), at which the wind was blowing from each of the 8 principal points of compass, during the year and during each month of the year 1899. Average for 9 stations in Michigan.**

Points of compass.	Average number of observations per month, 1899.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations, (9 stations)...........	91	93	83	93	89	93	89	92	91	90	93	89	93
Calm...............	6	2	3	3	7	6	6	6	7	3	6	4	2
North..............	6	4	4	9	5	6	4	6	6	11	7	7	4
Northeast..........	9	5	3	11	8	15	10	7	14	10	12	13	2
East................	5	6	3	8	6	11	5	4	6	5	4	4	0
Southeast..........	9	5	4	9	12	8	6	9	13	8	12	10	8
South...............	10	13	9	7	11	10	9	9	10	7	16	7	9
Southwest..........	22	33	28	14	13	15	27	24	18	17	20	22	32
West................	12	13	15	12	15	11	11	10	7	9	5	12	20
Northwest..........	14	14	15	20	12	10	11	17	11	21	10	11	15

*The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 1.

Graphic representations of statements in Table XII, are given in Diagram XIV.

DIAGRAM XIV.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1899.



[PLATE 1051.]

TABLE XIII.—*Average number of observations per month for the year 1899, at which the wind was blowing from each of the 8 principal points of the compass, at each of 9 stations* in Michigan; also the average line for the 9 stations.*

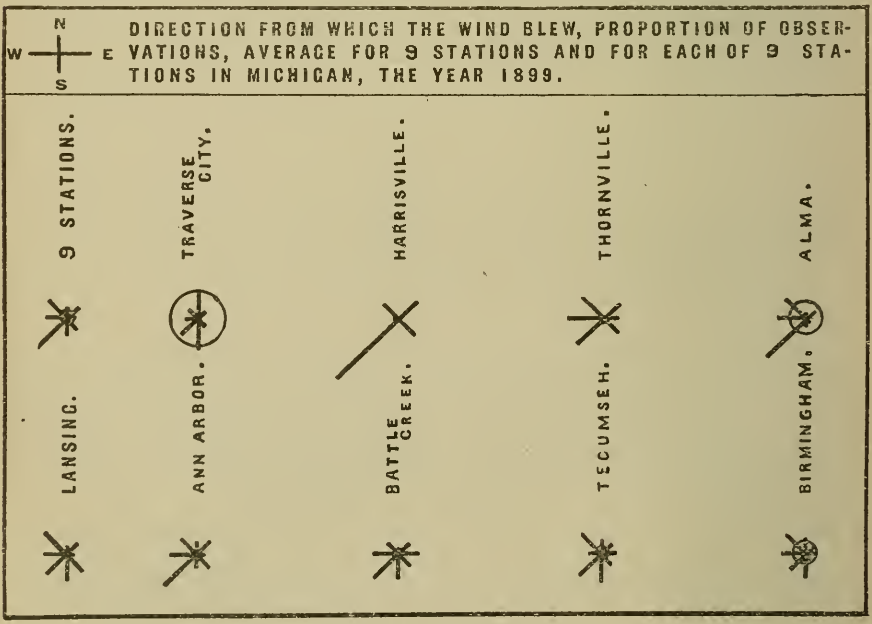
Stations in Michigan.*	Divisions of the State.†	Average number of observations per month, 1899.									
		All obs.	Calms.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Average for 9 stations........		90	4	6	9	5	9	10	22	12	14
Traverse City..................	N. W.	90	15	16	6	2	6	16	13	7	7
Harrisville.....................	N. E.	91	0	0	14	0	13	1	47	2	14
Thornville.....................	B. & E.	91	0	1	12	8	11	3	20	20	17
Alma...........................	C.	91	9	4	7	2	3	5	30	17	15
Lansing, S. B. of H...........	C.	91	0	5	9	5	13	15	15	12	17
Ann Arbor.....................	S. C.	91	2	7	10	5	10	7	24	14	13
Battle Creek..................	S. C.	91	2	4	8	11	9	14	20	14	9
Tecumseh.....................	S. C.	91	4	9	9	8	8	15	17	7	16
Birmingham...................	S. E.	87	7	9	7	6	4	13	12	13	16

*The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

†The full names of the divisions and the counties in each division are stated in Exhibit I, in preceding reports.

Graphic representations of statements in Table XIII, are given in Diagram XV.

DIAGRAM XV.—WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1899.



[PLATE 1052.]

TABLE XIV.—*Number of observations for months and year 1899, at which the wind was blowing from each of the 8 principal points of the compass, at 11 stations* in Michigan; also average line for 9 of the said stations from which nearly complete observations were received for the year. (Observations were made at 7 A. M., 2 P. M. and 9 P. M., daily.)*

Stations in Michigan.*	Divisions of the State.*	January.										February.										March.									
		Total.	Calm.	N.	N.E.	E.	S. E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S. E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S. E.	S.	S.W.	W.	N.W
Av. 9 stations †..	....	93	2	4	5	6	5	13	33	13	14	83	3	4	3	3	4	9	28	15	15	93	3	9	11	8	9	7	14	12	20
Rockland........	U. P.	89	3	18	3	22	8	12	6	6	11	78	6	17	9	20	2	5	2	6	11	86	11	25	6	16	2	2	0	6	18
Traverse City....	N. W.	93	5	2	1	2	6	26	21	19	11	83	19	14	2	1	5	17	15	2	8	93	11	28	6	4	7	12	4	8	13
Harrisville......	N. E.	93	0	0	3	0	5	0	66	5	14	84	0	0	9	0	8	1	42	6	18	93	0	1	16	0	9	4	30	4	29
Conklin..........	W.	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....	93	0	0	1	0	4	11	33	35	9
Thornville.......	B. & E.	93	1	1	5	8	10	4	25	19	20	84	1	0	0	3	5	1	32	23	19	93	0	1	8	3	13	5	21	17	25
Alma............	C.	93	1	3	11	4	0	5	48	15	6	84	0	0	4	2	1	4	38	23	12	93	3	9	30	8	0	4	16	11	12
Lansing, S. B. of H..........	C.	93	0	4	4	5	10	19	23	15	13	84	0	0	4	5	4	14	23	15	19	93	0	8	5	7	16	9	11	14	23
Ann Arbor	S. C.	93	3	3	4	8	4	6	37	16	12	84	0	7	4	2	3	8	27	18	15	93	5	9	11	10	6	9	9	15	19
Battle Creek.....	S. C.	93	5	2	5	12	2	3	35	13	16	84	2	3	4	4	4	6	41	11	9	91	3	6	8	12	9	3	13	9	28
Tecumseh.......	S. C.	93	2	8	5	8	4	27	19	7	13	84	1	8	0	4	2	23	19	13	14	93	0	10	8	15	9	9	9	8	25
Birmingham.....	S. E.	90	2	9	3	5	2	27	19	6	17	77	2	2	2	4	0	7	14	22	24	93	6	6	8	10	10	5	13	25	10

*Names of observers, etc., are given in Exhibit 1. Names of divisions, etc., are given in Exhibit 1, in a paper which follows, on weekly reports of sickness.

†This line includes only the 9 stations from which statements complete, or nearly complete, were received for every month of the year. It does not include Rockland and Conklin.

Graphic representations of statements for nine lines in this table are given in Diagram XII, which is explained on page 62 of the annual report for 1898, and in preceding reports.

TABLE XIV.—CONTINUED.—*Direction of wind, months in 1899.—Observation at which the wind was blowing from direction named.*

Stations in Michigan.*	Divisions of the State.*	April.										May.										June.									
		Total.	Calm.	N.	N.E.	E.	S. E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S. E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S. E.	S.	S.W.	W.	N.W
Av. 9 stations†	....	89	7	5	8	6	12	11	13	15	12	93	6	6	15	11	8	10	15	11	10	89	6	4	10	5	6	9	27	11	11
Rockland	U. P.	82	6	7	1	0	12	18	5	13	20	74	5	2	1	3	15	20	4	6	18	......	......	....	....	....	....	..	....	....	....
Traverse City	N. W.	90	15	23	5	1	4	17	8	10	7	93	17	26	4	1	8	16	10	3	7	89	17	13	10	0	4	17	18	4	6
Harrisville	N. E.	90	0	0	16	2	21	0	31	2	18	93	0	0	35	0	13	2	29	1	13	90	0	0	11	1	11	1	60	0	6
Conklin	W.	90	14	6	2	5	12	9	15	23	4	93	17	1	1	1	16	19	21	8	9	90	10	5	1	2	2	14	25	18	13
Thornville	B. & E.	87	0	0	6	8	17	2	9	29	16	93	1	0	20	19	9	2	15	20	7	90	0	1	19	9	3	1	33	12	12
Alma	C.	90	29	2	10	2	3	4	20	11	9	93	29	2	11	0	5	7	15	5	19	90	24	0	3	2	0	14	14	19	14
Lansing, S. B. of H.	C.	90	0	3	7	3	23	18	8	15	13	93	0	6	8	12	11	14	15	10	17	90	0	4	8	7	10	17	19	15	10
Ann Arbor	S. C.	90	3	6	5	7	10	19	11	18	11	93	5	9	14	10	5	5	25	10	10	90	0	4	12	6	6	6	36	11	9
Battle Creek	S. C.	90	3	1	11	12	9	8	14	22	10	93	1	1	12	25	6	12	9	26	1	90	1	1	11	11	6	6	26	23	5
Tecumseh	S. C.	90	1	6	9	7	12	14	15	11	15	93	0	9	9	13	12	22	10	6	12	90	2	6	6	8	7	16	24	3	18
Birmingham	S. E.	81	8	5	6	11	6	16	4	18	7	90	4	2	21	16	7	10	8	16	6	84	6	9	6	2	3	17	16	8	17

*†These foot-notes are at bottom of first page of this table.

Graphic representations of statements for nine lines in this table are given in Diagram XII, which is explained on page 62 of the annual report for 1898, and in preceding reports.

TABLE XIV.—CONTINUED.—*Direction of wind, months in 1899.—Observations at which the wind was blowing from direction named.*

Stations in Michigan.*	Divisions of the State.*	July.										August.										September.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W
Av. 9 stations†	....	92	6	6	7	4	9	9	24	10	17	91	7	6	14	6	13	10	18	7	11	90	3	11	10	5	8	7	17	9	21
Rockland	U. P.	88	5	26	3	13	19	4	1	4	13	91	11	11	2	24	11	8	10	5	9	89	10	21	6	11	12	4	2	5	18
Traverse City	N. W.	93	22	20	11	4	2	8	14	6	6	81	19	14	5	3	3	23	7	5	2	90	12	24	12	3	4	14	14	4	3
Harrisville	N. E.	93	0	0	12	0	10	0	65	1	5	93	0	0	8	0	11	3	51	0	20	90	0	0	17	0	21	0	30	3	19
Conklin	W.	93	20	1	0	0	0	1	14	48	9	93	30	0	0	0	1	9	26	26	1	90	20	9	8	2	0	1	11	16	23
Thornville	B.& E.	93	1	3	14	7	11	5	11	12	29	93	0	1	25	5	25	8	7	14	8	90	0	1	15	15	6	0	15	14	24
Alma	C.	93	11	2	3	0	10	3	22	16	26	93	9	1	10	1	0	0	41	11	20	90	1	18	4	6	1	3	18	16	23
Lansing, S. B. of H.	C.	93	0	3	9	6	11	13	11	17	23	93	0	3	25	4	21	8	10	10	12	90	0	13	6	5	12	7	9	10	28
Ann Arbor	S. C.	93	0	2	8	0	17	4	26	17	19	93	1	7	19	3	21	2	23	8	9	90	3	10	12	1	10	1	20	9	24
Battle Creek	S. C.	93	0	5	0	14	13	27	23	8	3	93	9	6	7	16	12	31	3	8	1	90	0	9	6	9	10	20	13	15	8
Tecumseh	S. C.	93	5	8	7	5	5	14	23	7	19	93	8	4	22	11	16	5	11	1	15	90	2	17	6	8	6	6	23	0	22
Birmingham	S. E.	82	13	7	3	1	3	10	18	4	23	89	15	18	4	11	5	13	6	4	13	89	10	8	8	1	3	8	7	6	38

*†These foot-notes are at bottom of first page of this table.

Graphic representations of statements for nine lines in this table are given in Diagram XII, which is explained on page 62 of the annual report for 1898, and in preceding reports.

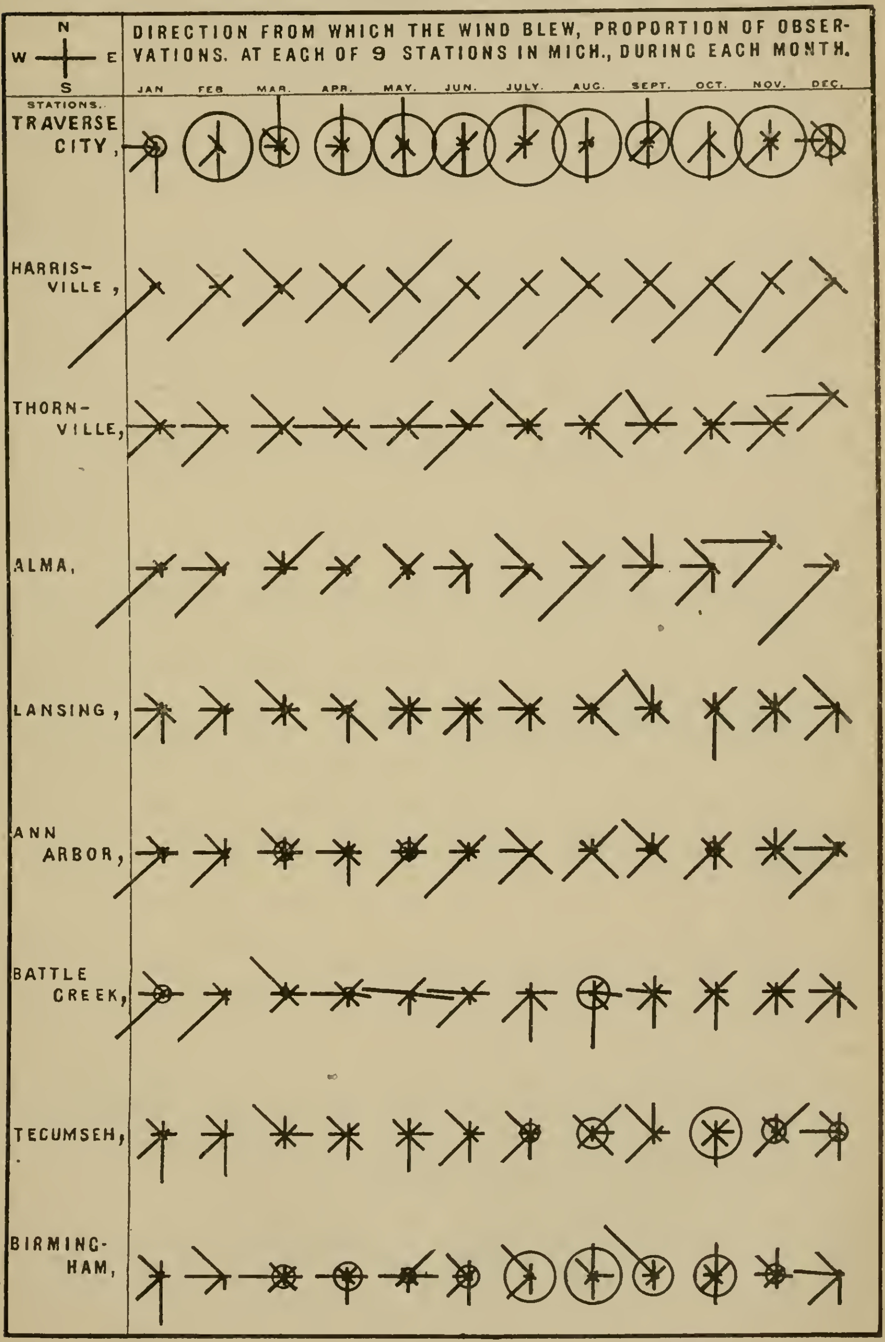
TABLE XIV.—CONCLUDED.—*Direction of wind, months in 1899.—Observations at which the wind was blowing from direction named.*

Stations in Michigan.*	Divisions of the State.*	October.										November.										December.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W
Av. 9 stations†	....	93	6	7	12	4	12	16	20	5	10	89	4	7	13	4	10	7	22	12	11	93	2	4	2	0	8	9	32	20	15
Rockland	U. P.	74	2	15	0	29	9	9	4	1	5	......	......	....	....	....	....	..	....	....	...	......	......	....	....	....	....	..	....	....	....
Traverse City	N. W.	93	19	11	6	2	12	22	17	2	1	90	19	12	8	3	6	11	19	4	8	93	9	9	1	0	11	14	13	20	16
Harrisville	N. E.	93	0	0	18	0	24	1	46	0	4	90	0	0	16	0	10	1	53	2	8	93	0	0	2	0	11	1	56	5	18
Conklin	W.	93	2	13	15	5	1	14	14	22	7	90	14	2	0	0	1	9	46	6	12	93	3	4	2	0	9	1	32	23	19
Thornville	B. & E.	93	0	3	19	8	14	8	23	5	13	90	0	0	13	8	9	1	21	24	14	93	0	0	3	0	10	1	28	40	11
Alma	C.	93	2	2	1	0	5	14	29	18	22	90	0	3	0	0	6	0	33	40	8	93	0	2	0	0	0	3	61	18	9
Lansing, S. B. of H.	C.	93	0	9	17	3	16	29	8	2	9	90	0	8	15	2	12	13	18	8	14	93	0	3	1	0	11	14	25	13	26
Ann Arbor	S. C.	93	4	7	13	6	14	12	23	5	9	90	1	12	16	5	19	6	10	11	10	93	0	3	5	1	7	4	38	24	11
Battle Creek	S. C.	93	0	5	16	7	10	21	17	6	11	90	0	5	18	10	13	13	17	7	7	93	0	5	2	0	14	15	26	17	14
Tecumseh	S. C.	93	14	7	10	10	10	20	11	1	10	90	7	10	22	2	9	6	19	4	11	93	5	11	1	1	4	15	19	22	15
Birmingham	S. E.	92	11	18	12	4	6	16	10	7	8	85	5	16	6	9	3	8	10	12	16	90	0	2	2	2	0	17	24	25	18

*†These foot-notes are at bottom of first page of this table.

Diagram XII exhibits lines showing, by months, directions of wind at each of nine stations in this table; for each month and station the diagram represents the figures given in this table for the same month and stations; it is explained on page 62 of the annual report for 1898, and in preceding reports.

DIAGRAM XII.—WIND, DIRECTION, AT STATIONS, BY MONTHS, 1899.



[PLATE 1050.]

TABLE XV.—*Average daily range of atmospheric pressure (as determined from three daily observations) for months and year 1899, at 10 stations, also average line for 8 stations* in Michigan—stations arranged in order by latitude, those farthest north first.*

Stations in Michigan.*	Average daily range of barometer—Year and months, 1899.														
	Norm. †	1898.	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 stations‡	......	......	.179	.282	.212	.302	.136	.141	.140	.102	.110	.169	.144	.178	.229
Rockland	......	.215	¶	g .256	f .223	d .301	f .212	h .197	.....	i .134	e .147	h .274	.....	.....	.....
Traverse City	18 .213	.216	.192	.287	.214	.301	.170	.150	.161	.104	d .121	.207	.161	.183	.241
Alma	......	.237	§	.381	.441	.346	.160	.142	.128	.099	.090	.199	b .191	b .243	.....
Harrisville	5 .210	.214	.191	.297	.215	.305	.153	.166	.153	.112	.116	.188	b .148	b .193	.240
Thornville	16 .212	.211	.180	.293	.221	.292	.112	.132	.140	.105	.106	.172	.152	.183	.248
Lansing, S. B. of H.	18 .203	.201	.182	.288	.216	.316	.138	.145	.141	.105	.109	.175	.135	.175	.240
Birmingham	13 .211	.220	.200	a .335	d .223	.340	c .160	c .161	c .148	c .109	b .117	c .192	a .167	.196	a .249
Battle Creek	......	......	.138	.184	.173	.239	.109	.102	.110	.098	b .128	.108	b .105	.130	.169
Ann Arbor	18 .204	.206	.181	.289	.216	a .333	.130	.131	.135	.101	.103	.163	.149	.178	.241
Tecumseh	......	......	.167	.281	.220	.292	.114	.143	.128	.083	.082	.143	.135	.183	a .204

*The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1. The average atmospheric pressure at each of these stations, by months, in 1899, is given in Table XVII.

†Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1899. The small figures above and at the right of numbers which state the average daily range denote the number of years included in the average.

‡Not including Rockland and Alma.

¶The average for 8 months is .218. §For 11 months, .220.

a For 30 days. b For 29 days. c For 28 days. d For 26 days. e For 25 days. f For 24 days. g For 23 days. h For 21 days. i For 19 days.

NOTE.—The latitude and elevations of some of the stations in Table XV, are stated in Exhibit 2.

The daily range is found by subtracting the lowest observation from the highest observation, 7 A. M. to 7 A. M.

Foot notes to Table XVI.

*Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with December 31, 1899. The small figures above and at the right of the numbers which state the average denote the number of years included in the average.

†Represents the difference between the highest of 8 stations and the lowest of 8 stations for year and for each month of year, not including Rockland and Alma.

‡Represents sum of ranges at 8 stations divided by 8.

§The average for 8 months is 1.007. ‖For 11 months, .812.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 24 days. h For 22 days. i For 21 days.

NOTE—The statements in the star (*) foot-note to Table XV. apply also to Table XVI.

TABLE XVI.—*Range of atmospheric pressure (as determined from three daily observations) for the year and for each month and for the average month of the year 1899, at 8 and at each of the 8 stations, and average line for 8 stations in Michigan; also the normal—average monthly range for a series of years. Stations named in order by latitude, those farthest North first.*

Stations in Michigan.	Range of barometer.—Year and months, 1899.															
	Norm. *	1898.	1899.	Av. Month.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
For 8 stations†	......	......	1.732	1.188	1.516	1.470	1.457	1.017	1.052	.833	.781	.892	1.113	1.200	1.388	1.534
Av. for 8 stations‡....	......	......	1.334	.802	1.245	1.105	.974	.719	.647	.517	.387	.540	.706	.698	.965	1.117
Rockland....	......	.961	......	§	[f] 1.487	[g] 1.354	[d] .816	[f] .860	[h] 1.089	.....	[i] .596	[d] .861	[g] .992	.....	.....	.....
Traverse City	[18] .948	.853	1.507	.884	1.394	1.233	.990	.898	.741	.563	.437	[e] .575	.799	.689	1.036	1.258
Harrisville..	[5] .911	.876	1.412	.855	1.412	1.175	1.060	.874	.694	.508	.373	.653	.714	[a] .722	[b] .924	1.149
Alma........	......	.846	......	‖	1.387	1.195	1.123	.796	.619	.911	.355	.484	1.057	[a] .713	.292	.....
Thornville...	[16] .934	.876	1.441	.813	1.209	1.098	1.029	.593	.589	.498	.425	.560	.749	.868	.962	1.179
Lansing, S. B. of H...	[18] .899	.853	1.258	.787	1.258	1.120	.979	.744	.596	.546	.418	.536	.759	.635	.989	.864
Birmingham.	[13] .917	.870	1.379	.859	[a] 1.261	[e] 1.169	1.015	[c] .720	[b] .832	[b] .517	[c] .391	[a] .557	[b] .831	[a] .798	[b] .991	[a] 1.230
Battle Creek.	......	......	1.028	.637	.933	.822	.840	.619	.493	.441	.298	[a] .493	.355	[b] .518	.880	.946
Ann Arbor..	[18] .901	.888	1.307	.798	1.225	1.101	[a] .957	.702	.570	.551	.427	.494	.733	.689	.950	1.179
Tecumseh ...	......	......	1.340	.779	1.270	1.118	.922	.600	.664	.508	.325	.453	.705	.668	.988	1.128

Foot-notes at bottom of page 52.

EXHIBIT 27.—*Average atmospheric pressure, by year and months, in 1899, compared with annual and monthly averages for 1898, and for the 22 years, 1877-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Average atmospheric pressure.—Inches of mercury.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 22 years, 1877-98.	29.131	29.145	29.148	29.131	29.121	29.089	29.092	29.111	29.129	29.171	29.150	29.144	29.141
1898 (9 stations)....	29.080	29.026	29.091	29.149	29.123	29.021	29.068	29.127	29.069	29.098	29.088	29.072	29.029
1899 (9 stations)....	29.160	29.175	29.102	29.054	29.163	29.165	29.192	29.140	29.154	29.195	29.278	29.193	29.106
In 1899 greater than av. for 22 years, 1877-98.....	.029	.030	......	......	.042	.076	.100	.029	.025	.024	.128	.049	......
In 1899 less than av. for 22 years. 1877-98...........	....	......	.046	.077	......	......	......	......	......	......	......	......	.035
In 1899 greater than in 1898......	.080	.149	.011	......	040	.144	.124	.013	.085	.097	.190	.121	.077
In 1899 less than in 1898...........	... .	......	......	.095	......	......	......	......	......	......	......	......	......

*At from 7 to 20 stations per year for the 22 years, 1877-98. Just which stations in each year, up to 1897, are shown on page 75, report for 1898.

TABLE XVII.—*Average atmospheric pressure for months and year 1899, at each of 11 stations in Michigan; also averages for 9 stations; as indicated by the height, in inches, of Mercury in the barometer. Corrected for temperature.—Reduced to 32° F. (for some stations not corrected for instrumental errors*).—Average of observations made daily at 7 A. M., 2 P. M. and 9 P. M. by observers† for the State Board of Health.*

Stations in Michigan.†	Divisions of the State.‡	Inches of Mercury—Atmospheric pressure. Years. Norm.§	Years. 1899.	Months, 1899. Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations ‖	....	....	29.160	29.175	29.102	29.054	29.163	29.165	29.192	29.140	29.154	29.195	29.278	29.193	29.106
Rockland	U. P.	....	¶	28.609[f]	28.571[g]	28.633[d]	28.630[f]	28.693[h]	....	28.663[i]	28.676[d]	28.744[g]	....	....	....
Traverse City	N. W.	29.322[18]	29.318	29.301	29.279	29.259	29.299	29.322	29.321	29.280	29.304[e]	29.364	29.450	29.394	29.243
Harrisville	N. E.	29.328[5]	29.329	29.320	29.294	29.269	29.339	29.348	29.352	29.303	29.322	29.346	29.422[a]	29.370[b]	29.263
Thornville	B. & E.	28.956[20]	28.981	28.995	28.944	28.886	28.999	29.013	29.037	28.971	28.997	28.993	29.095	28.960	28.885
Alma	C.	....	**	29.224	29.161	29.163	29.186	29.182	29.050	28.641	28.661	28.711	28.799[a]	28.443	....
Agricultural College	C.	29.081[18]	29.075	29.186	28.849	28.924	29.082	29.083	29.110	29.052	29.067	29.138	29.224	29.134	29.046
Lansing, S. B. of H.	C.	29.063[21]	29.085	29.089	29.044	28.971	29.077	29.093	29.119	29.063	29.079	29.126	29.207	29.118	29.037
Ann Arbor	S. C.	29.034[19]	29.054	29.049	29.008	28.938[a]	29.097	29.051	29.085	29.022	29.042	29.081	29.172	29.103	29.001
Battle Creek	S. C.	....	29.355	29.359	29.331	29.242	29.341	29.351	29.385	29.380	29.351[a]	29.408	29.430[b]	29.377	29.308
Tecumseh	S. C.	....	29.153	29.172	29.105	29.031	29.149	29.149	29.201	29.131	29.134	29.192	29.278	29.170	29.122
Birmingham	S. E.	29.106[13]	29.087	29.103[a]	29.063[e]	28.969	29.081[c]	29.072[b]	29.122[b]	29.057[c]	29.091[a]	29.107[b]	29.220[a]	29.109[b]	29.048[a]

*A correction has been made for instrumental error of barometer at Ann Arbor; .004 has been added to each monthly average during the year 1899. At the Agricultural College, -.013 has been subtracted from each monthly average. For other stations the instrumental error of barometer is not known.

†The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1.

‡The full names of divisions and the counties in each division are stated in Exhibit 1, in preceding reports.

§Numbers in this column state the average annual atmospheric pressure for periods of years ending in each case with December 31, 1899. The small figures at the right of the numbers which state the average denote the number of years included in the average.

‖This line is an average for nine stations, at which observations, nearly complete, were received for every month in the year. It does not include Rockland and Alma. Green's standard barometer was used at all the 11 stations for 1899.

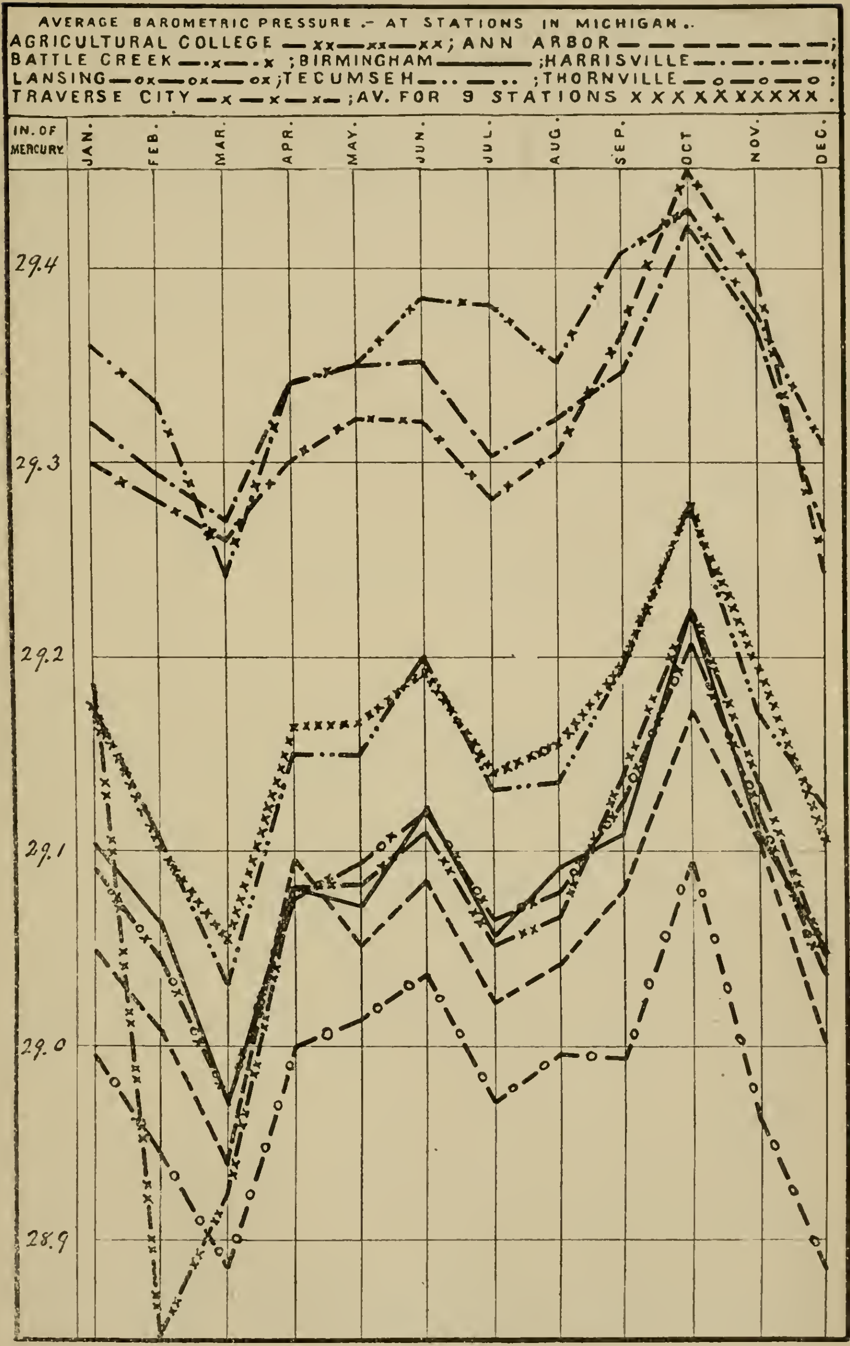
¶The average for 8 months is 28.652. **For 11 months, 28.929.

NOTE.—Computations of monthly averages for the year 1899 were furnished by the observers at Ann Arbor and the Agricultural College. The remainder of the computations were made at the office of the State Board of Health.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 24 days. h For 22 days. i For 21 days.

The average line and lines for nine stations in this table are graphically represented in Diagram XVI.

DIAGRAM XVI.—ATMOSPHERIC PRESSURE, BY MONTHS, 1899.



[PLATE 1053.]

EXHIBIT 28.—*Average daily range of atmospheric pressure, by year and months, in 1899, compared with annual and monthly averages for 1898, and for the 17 years, 1882-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Average daily range of barometer.—Year and months, 1899.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 17 years, 1882-98	.211	.301	.292	.263	.215	.167	.136	.126	.132	.169	.207	.254	.268
1898 (8 stations).....	.215	.368	.229	.232	.192	.155	.164	.116	.134	.180	.211	.305	.293
1899 (8 stations).....	.179	.282	.212	.302	.136	.141	.140	.102	.110	.169	.144	.178	.229
In 1899 greater than av. for 17 years, 1882-98......	....	......	......	.039	......	......	.004	......	......	0	......	......	......
In 1899 less than av. for 17 years, 1882-98.............	.032	.019	.080	......	.079	.026	......	.024	.022	......	.063	.076	.039
In 1899 greater than in 1898.......	....	......	......	.070	......	......	......	......	......	......	......	......	......
In 1899 less than in 1898............	.036	.086	.017	......	.056	.014	.024	.014	.024	.011	.067	.127	.064

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*At from 8 to 18 stations per year for the seventeen years, 1882-98. Just which stations in each year, up to 1897, are shown on page 78, report for 1893.

EXHIBIT 29.—*Range of atmospheric pressure, by year and months, in 1899, compared with annual and monthly averages for 1898, and for the 17 years, 1882-98.* These averages are for groups of several stations in Michigan.*

Years, etc.	Range of barometer.—Year and months, 1899.												
	Annual av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 17 years, 1882-98	.950	1.271	1.278	1.124	1.031	.797	.703	.584	.606	.806	.999	1.102	1.128
1898 (8 stations).....	.878	1.240	.832	.859	.835	.687	.931	.598	.493	.991	.894	1.005	1.174
1899 (8 stations).....	.802	1.245	1.105	.974	.719	.647	.517	.387	.540	.706	.698	.965	1.117
In 1899 greater than av. for 17 years, 1882-98......	....	......	......	......	......	......	......	......	......	......	......	......	......
In 1899 less than av. for 17 years 1882-98.............	.148	.026	.173	.150	.312	.150	.186	.197	.066	.100	.301	.137	.011
In 1899 greater than in 1898.......	....	.005	.273	.115	......	......	......	......	.047	......	......	......	......
In 1899 less than in 1898............	.076	......	......	......	.116	.040	.414	.211	......	.285	.196	.040	.057

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*At from 8 to 18 stations per year for the seventeen years, 1882-98. Just which stations in each year, up to 1897, are shown on page 78, report for 1898.

Sunshine and clouds.—On the back of each blank register supplied by this Board to observers, on which they are to register meteorological data, is a statement that "One observer has reported a record of days 'all or nearly all cloudy' and days 'all or nearly all sunshine.' The State Board of Health would be glad to have such a report from all observers who can conveniently make it. Memoranda may be made in a column headed 'cloudy or sunny,' days more than eighty per cent of clouds being marked with the abbreviation 'C,' indicating *cloudy*, and days with less than 20 per cent of clouds with an 'S,' indicating *sunshine*."

EXHIBIT 30.—*Statements of the number of days in each month which were reported "sunny," "partly cloudy," and "cloudy," by observers at stations in Michigan.*

Stations in Michigan.	1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Rockland....	S.	8	14	14	21	21	......	21	16	22	15	......	......
	P. C.	0	0	0	0	0	......	0	0	0	0	......	......
	C.	23	14	15	9	5	......	10	15	8	15	......	......
Marquette........	S.	7	9	5	7	6	6	4	5	1	8	7	3
	P. C.	8	8	13	11	9	12	17	16	13	7	4	6
	C.	16	11	13	12	16	12	10	10	16	16	19	22
Sault Ste. Marie.	S.	6	9	7	11	9	11	7	15	7	9	5	2
	P. C.	6	9	8	7	12	12	17	12	9	4	4	9
	C.	19	10	16	12	10	7	7	4	14	18	21	20
Traverse City....	S.	4	......	7	8	12	10	11	12	......	12	6	4
	P. C.	4	......	7	18	12	17	14	12	......	10	8	2
	C.	23	......	17	4	7	3	6	3	......	9	16	25
Alpena...........	S	4	......	......	8	12	12	11	14	5	9	4	3
	P. C.	16	......	......	13	10	10	15	13	14	11	5	4
	C.	11	......	......	9	9	8	5	4	11	11	21	24
Conklin..........	S.	2	3	3	12	19	23	15	26	12	12	19	4
	P. C.	3	8	4	10	2	5	7	5	7	6	4	5
	C.	26	17	24	8	10	2	9	0	11	13	7	22
Grand Haven....	S.	3	4	2	11	8	11	11	16	11	15	5	4
	P. C.	7	5	10	10	15	17	14	13	11	8	9	3
	C.	21	19	19	9	8	2	6	2	8	8	16	24
Port Huron......	S.	6	5	2	11	8	15	13	18	9	17	7	10
	P. C.	11	17	14	11	13	13	12	7	10	4	5	3
	C.	14	6	15	8	10	2	6	6	11	10	18	18
Thornville.......	S.	6	15	8	19	10	22	17	25	16	20	10	9
	P. C.	9	5	7	4	13	8	9	2	6	3	5	1
	C.	16	8	16	7	8	0	5	4	8	8	15	21
Alma.............	S.	22	25	16	12	......	......	17	25	......	13	11	......
	P. C.	0	0	0	0	......	......	0	0	......	0	0	......
	C.	9	8	15	18	......	......	14	6	......	17	19	......
Lansing..........	S.	5	5	1	10	8	14	10	17	9	13	5	9
	P. C.	10	8	9	10	11	14	13	11	8	3	6	1
	C.	16	15	21	10	12	2	8	3	13	15	19	21
Ann Arbor.......	S.	12	11	8	18	10	14	7	7	4	11	4	5
	P. C.	0	5	0	0	8	13	14	19	14	10	8	10
	C.	19	12	23	12	13	3	10	5	12	10	18	16
Battle Creek.....	S.	12	16	13	23	20	22	20	24	17	20	6	8
	P. C.	0	0	0	0	0	0	0	0	0	0	0	0
	C.	19	12	18	7	11	8	11	7	13	11	24	23
Detroit...........	S.	3	3	2	9	7	17	11	18	9	15	4	5
	P. C.	13	9	11	14	15	10	14	10	9	8	11	11
	C.	15	16	18	7	9	3	6	3	12	8	15	15

THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF SICKNESS.

A STATISTICAL REPORT BASED ON WEEKLY POSTAL-CARD REPORTS OF SICKNESS IN MICHIGAN DURING THE YEAR 1899, AND COMPARISONS WITH PRECEDING YEARS.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper is the twenty-third in a series of articles upon the same general subject begun in the latter part of 1876. It presents a summary of the compilation of weekly reports of sickness in Michigan in 1899. It includes a series of graphic illustrations which show by months, in 1899, the rise and fall of twenty-eight of the most prominent diseases in Michigan.

One of the objects of this compilation is to learn the time of the greatest and of the least prevalence of each of the more important diseases in the State, and to note the connection of this prevalence with each of the meteorological conditions in the State.

Tables are given showing the per cent of the weekly *reports* and the per cent of *observers* which stated the presence of the various diseases; and by comparing Table 1 with Exhibit I, we see the correspondence in the two lines of evidence,—that of the "prevalence" of the diseases as shown by the per cent of *reports*, and the "area of prevalence" as shown by the per cent of *observers*, the diseases following each other in a somewhat similar order from highest to lowest—the diseases being arranged in the table, as in the exhibit, in the order of their greatest reported prevalence in 1899.

Propositions are stated as to the relations of specified meteorological conditions, and diseases are mentioned under these propositions in such manner as to suggest one method of studying some of the facts brought out in the compilation. Casual observation shows that certain diseases are much more prevalent in the hot months, while certain other diseases are much more prevalent in the cold months. The relation between these diseases and the atmospheric temperature is well marked, but accurate statistics are needed to show just what that relation is. We find, also, that other meteorological conditions than atmospheric temperature have a marked effect upon many of the diseases, apparently diminishing the effect of temperature in some instances, increasing its effect in other instances. For these reasons the State Board of Health undertakes, by a compilation of the weekly reports of sickness in connection with the various meteorological conditions, to learn what constant, and, therefore, probably causal relations exist between the humidity of the air, the ozone, the velocity of the wind, the atmospheric pressure, etc., and the increased or diminished prevalence of each disease in certain months as compared with other months in the same year, or with the same month in other years or series of years.

To facilitate the study of the causes of sickness and deaths, the State is divided into eleven geographical divisions, a list of which, and the counties embraced in each, appear in Exhibit I, in preceding reports. On pages 201 and 217 of the report of this Board for 1886, the divisions and the counties in each were indicated by lines on maps of the State.

Physicians should have compensation for weekly reports of sickness.—Great credit is due the busy medical practitioners in Michigan who forward these reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation; a few health officers have slight pay from their local boards of health. Each one should have full compensation. No other class of persons has knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

Plan of the weekly card reports.—The plan of the weekly reports remains the same as last year. (Cards having *pleuritis* printed on them were first used for weekly reports in October, 1887.) Observers now report only the diseases under their own personal observation. Previous to the year 1885, some of the observers reported such diseases as they believed to be present in their locality, even though not under their own observation. The change in method of making the reports may account partially for the apparent decrease in sickness in 1899, when compared with the average for the twenty-two years, 1877-98, as shown in Exhibits VIII and X, on subsequent pages. Details of the method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3; and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked 4, and the following week, with the same number of cases, be marked 1. Names of diseases printed in italics are not *printed* on the postal blanks, but are supposed to have been *written* on the report by the observer.

Diseases in..............................and vicinity,

Week ending Sat.,..............................,*189*...

DISEASES.	CASES OBSERVED.	
	Prevalence order. See a	No. of cases.
Brain, Inflammation of...	*14*	*1*
Bowels, Inflammation of.	*12*	*3*
Bronchitis	*11*	*4*
Cerebro-Spinal Meningitis	*0*	*0*
Cholera Infantum........	*8*	*9*
Cholera Morbus..........	*10*	*6*
Consumption, Pulmonary.	*10*	*6*
Croup, Membranous......	*12*	*3*
Diphtheria...............	*5*	*14*
Diarrhea	*3*	*17*
Dysentery	*8*	*9*
Erysipelas...............	*13*	*2*
Fever, Intermittent......	*2*	*21*
Fever, Remittent.........	*11*	*4*
Fever, Typhoid (Enteric).	*0*	*0*
Fever, Typho-malarial....	*9*	*7*
Influenza.................	*7*	*11*
Kidney, Inflammation of.	*14*	*1*
Measles...................	*1*	*27*
Neuralgia	*14*	*1*
Pleuritis..................	*0*	*0*
Pneumonia................	*9*	*7*
Puerperal Fever..........	*0*	*0*
Rheumtism................	*6*	*12*
Scarlet Fever.............	*4*	*16*
Smallpox..................	*0*	*0*
Tonsillitis	*11*	*4*
Whooping-cough.........	*0*	*0*
Mumps..................	*6*	*12*
Dyspepsia..............	*11*	*4*

Ed. 45.

a. If you do not state the number of cases, please mark the disease of which there is the greatest number of cases, 1; the disease, having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [Full statement of plan on second, third, and fourth pages of record book cover.] A blank indicates that the item has been overlooked.

Please mail this, signed and dated as soon as convenient after close of week.

NOTICE!—If this report includes a communicable disease, please write, below, the township, city, or village in which the disease is.

REMARKS:

....*M. D.*

Bulletins of "Health in Michigan."—During the year 1899 the issue of the weekly and monthly bulletins of "Health in Michigan" has been continued. These bulletins are compiled from the regular weekly card reports of physicians in all parts of the State, and from the health officers' reports of communicable diseases, which reports, excepting those weekly card reports made by voluntary observers, are made to the Secretary of the State Board of Health in compliance with law.

The bulletins give to the members of the State Board of Health, local health officers, and when published to the public, information concerning the "diseases which cause most sickness" in the State, the relative amount of sickness from each disease, and comparisons with the preceding week or month, thus showing any sudden increase or decrease which may have occurred in the prevalence of any disease, together with a comparison of the various meteorological conditions; also (in the monthly bulletin) a comparison with the average month for a series of years; also (in the weekly bulletin) lists of the localities in which each of the dangerous communicable diseases is reported present, which lists if widely published would serve to put people intending to visit such places on their guard against such diseases.

As a rule, about five-eighths of the card reports reach the office of the State Board of Health in time for compilation in the weekly bulletin, and the monthly bulletins are compiled from the information used in the weekly bulletins. It is found that the statements made in the monthly bulletins are corroborated by the information, after the close of the year, from the compilation of the whole number of the reports for the corresponding months of the year.

The bulletins are an immediate ephemeral use of some of the data supplied by the reports from localities, which data finally go to make up the permanently-valuable sickness statistics, and the communicable-disease statistics in Michigan; but even this ephemeral use has been the means of disseminating among the people of Michigan much information useful for the restriction and prevention of sickness and deaths.

A copy of the weekly bulletin has been sent to such editors as have expressed a desire to have it for use, entire or in part, in their papers; and copies of the monthly bulletin have been sent to the sanitary and medical journals which are received as exchanges by the library of the State Board of Health.

There are about 1,589 cities, villages and townships in Michigan, each of which is required by law to have a health officer, and nearly every one of them contributes some fact, and some of them very many facts, useful for the promotion of the public health. The State Board of Health serves to collect these facts, group them so as to make them most useful, and give them all out again to every locality for the general good.

Annual compilation of the weekly reports.—The reports from each locality are compiled by months. The average of the numbers stating the order of prevalence of the several diseases for the month is considered an indication of the actual order of prevalence of the diseases for that time. There is also found for each locality what per cent of the reports states the presence of each disease for the given month. This per cent of reports for a single locality indicates what portion of the month the disease was present in that locality. It may also be called the per cent of weeks the disease was present. These first results of the compilation are stated in Table 3, which, on account of the space required, has not been printed in the reports since that of 1882, but is preserved in the office of the State Board for reference and study.

A combination of the statements for localities in Table 3 is made by months for the State, so far as it is represented by the localities from which reports are received, showing: (1) What per cent of the observers reported each disease each month; (2) for the localities at which a given disease was reported, an average of the per cent of weeks it was reported at those localities; (3) what per cent of all the reports received for the month stated the presence of each disease; (4) an average of the numbers denoting the order of prevalence of each disease at the localities at which it was reported present during the month.

Diseases from which there was a marked increase or decrease in prevalence in Michigan in 1899.—By referring to Exhibit I, it will be seen that there was no disease which showed a marked increase in 1899 over the average for the twenty-two years, 1877-1898; the diseases in which the decrease in 1899 appears most marked, when compared with the above-mentioned average, are intermittent fever, remittent fever, pneumonia, typho-malarial fever, diphtheria, consumption, erysipelas, scarlet fever, cholera morbus, cholera infantum, inflammation of bowels, whooping-cough, and measles.

A part of the lessened prevalence of some of the prominent diseases may be due to the change in the method of reporting sickness, referred to under the head, "Plan of the weekly card reports," on a preceding page in this article.

A comparison of 1899 with the average for the ten years, 1889-1898, shows that, with the exception of cerebro-spinal meningitis, there was no disease which showed an increase in 1899; the diseases in which the decrease appears most marked in 1899, when compared with the last-named average, are intermittent fever, remittent fever, typho-malarial fever, whooping-cough, consumption, pneumonia, cholera morbus, measles, erysipelas, and diphtheria.

Method of comparison of diseases by years, months, and weeks.—In the annual reports ending with that for 1888, mention was made of diseases in which a difference of seven or more was shown between the per cents of reports stating the presence of the disease in the current year and in the preceding year or term of years; in the reports since that for 1888 those diseases were mentioned of which the comparison showed an increase or decrease of twenty-five per cent from the preceding year, or from the normal, as the case may be.

In this report, those diseases which are reported by seven or more observers, and which show an increase or decrease of twenty-five per cent are generally mentioned, except in cases of cholera, smallpox, typhus fever or other particularly interesting or dangerous disease, and these are specially considered in each instance.

EXHIBIT I.—*Stating, for each of 11 years, 1889-1899, the number of reports received, and on what per cent of these reports each of 28 diseases was stated to be present; also an average for the period of 22 years, 1877-1898, and an average for the period of 10 years, 1889-1898. The diseases are arranged in the order of greatest area of prevalence in 1899. (Continued for each month of 1898 and 1899 on the two pages following.)*

Line number.	Diseases.	What per cent of the reports stated the presence of the disease.												
		Av. 1877-98.†	Av. 1889-98.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.
	Av. Disease*........	25	21	17	17	18	18	20	20	20	21	25	25	23
1	Rheumatism........	67	64	63	62	66	60	60	62	64	64	69	71	65
2	Neuralgia	63	59	56	54	58	54	56	56	57	61	66	67	63
3	Bronchitis	58	54	50	49	50	51	52	50	53	54	60	65	58
4	Influenza	41	45	42	45	47	44	44	41	43	42	55	53	32
5	Tonsillitis...........	47	46	42	40	43	45	43	42	49	48	49	50	46
6	Diarrhea............	44	41	37	36	34	34	42	40	40	43	47	44	45
7	Consumption, pul..	49	35	22	20	20	23	29	36	38	38	49	52	48
8	Inflam. of kidney...	19	19	19	17	17	16	20	17	17	21	20	21	20
9	Pneumonia	29	23	17	17	19	18	21	20	22	25	27	30	26
10	Intermittent fever.	49	27	17	19	17	19	22	24	24	27	36	41	43
11	Pleuritis............	17	17	16	15	18	16	17	13	14	18	21	19	17
12	Dysentery	17	14	13	12	12	11	15	14	13	15	16	16	17
13	Remittent fever....	34	20	12	13	11	16	20	20	18	21	28	27	30
14	Cholera morbus	16	14	10	12	10	11	15	14	14	15	16	15	14
15	Inflam. of bowels...	14	12	10	10	10	10	11	13	12	13	15	14	14
16	Erysipelas	20	16	10	12	14	12	13	13	14	16	19	21	22
17	Typhoid fever (ent.)	11	10	9	8	7	10	13	11	9	9	11	8	10
18	Cholera infantum..	12	10	8	8	8	8	12	12	10	11	13	10	11
19	Scarlet fever.......	13	9	8	5	4	8	12	14	10	12	9	10	10
20	Measles	11	8	6	7	13	7	4	6	7	4	10	12	6
21	Whooping-cough...	14	9	4	5	4	7	9	12	9	10	9	9	16
22	Cerebro-spinal men.	3	2	3	2	1	1	0.8	1	2	2	3	3	3
23	Diphtheria..........	13	6	3	3	5	5	5	7	7	7	6	8	6
24	Puerperal fever....	4	3	2	2	2	2	2	2	3	4	3	4	5
25	Inflam. of brain ...	4	3	2	2	2	3	3	3	3	3	4	5	5
26	Typho-mal. fever...	14	5	1	2	0.9	2	4	4	4	5	6	7	16
27	Membran. croup....	4	2	0.6	0.5	0.7	1	2	2	2	3.	4	4	3
28	Smallpox	0.7	0.5	0.4	.04	.05	4	0.3	0.6	0.3	.02	0	0.1	.03
	No. of reports received.	‡4,571	‡4.891	5.126	5,219	4,418	3,940	4,395	5,572	5,853	5,281	4,291	4,939	5,000

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*The numbers opposite the names of the diseases do not state what per cent of the whole number of reports for the year stated the disease to be present at some time during the year, but state (on an average for twelve months of the year) what per cent of reports for the several months stated the disease to be present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the reports for that month (the number of which is stated at the foot of the column) stated the given disease to be present in that month.

†Foot-note on page 77.

‡Average per year.

EXHIBIT I.—CONTINUED.—*Stating for each of 28 diseases by months, on what per cent and 1899; also the average by months for the period of 22*

What per cent of the reports received stated presence of the disease.

Line number.	January. Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	February. Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	March. Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.
	Average disease*..	26	22	18	17	Average disease*..	26	21	19	18	Average disease*.	26	22	18	17
1	Influenza..........	62	71	88	66	Influenza..........	66	74	91	67	Influenza..........	64	72	77	69
2	Rheumatism......	70	68	63	68	Bronchitis	72	67	62	51	Rheumatism......	72	69	68	73
3	Bronchitis	71	66	63	58	Rheumatism......	70	67	59	70	Bronchitis	71	66	59	54
4	Neuralgia	67	65	58	66	Neuralgia	68	66	58	65	Neuralgia..........	70	68	57	67
5	Tonsillitis.........	58	56	53	50	Tonsillitis..	58	56	49	54	Tonsillitis	57	54	49	48
6	Pneumonia	49	41	37	32	Pneumonia........	52	42	46	34	Pneumonia........	50	38	35	28
7	Consumption, pul.	50	36	20	14	Pleuritis	24	23	24	24	Pleuritis	25	25	24	23
8	Inflam. of kidney..	20	19	20	19	Consumption, pul.	51	36	19	16	Diarrhea	28	26	22	20
9	Diarrhea..........	26	25	19	22	Diarrhea	26	24	17	22	Inflam. of kidney..	22	20	22	19
10	Pleuritis	25	25	19	28	Inflam. of kidney.	21	20	16	17	Consumption, pul.	52	37	19	17
11	Intermittent fev..	40	21	13	12	Scarlet fever......	16	10	14	5	Erysipelas.........	24	19	12	17
12	Erysipelas.........	22	17	12	13	Erysipelas.........	23	18	13	13	Scarlet fever......	16	10	11	3
13	Scarlet fever......	17	12	12	7	Intermittent fev..	40	20	12	11	Intermittent fev..	43	22	11	14
14	Inflam. of bowels.	12	9	9	10	Remittent fever..	28	16	10	7	Remittent fever..	29	16	8	8
15	Remittent fever..	28	17	7	9	Inflam. of bowels..	11	10	8	8	Inflam. of bowels..	13	11	8	9
16	Whooping-cough..	14	8	4	4	Diphtheria........	15	6	4	6	Measles	15	12	7	11
17	Inflam. of brain...	4	3	3	1	Measles	12	9	3	6	Cerebro-spi. men .	4	2	6	2
18	Dysentery.	6	6	3	4	Inflam. of brain...	5	4	3	3	Diphtheria........	13	5	4	4
19	Diphtheria........	17	8	3	5	Dysentery.........	6	5	2	3	Typhoid fev. (ent.)	5	4	3	6
20	Typhoid fev.(ent.)	9	7	3	6	Puerperal fever ..	4	4	2	2	Dysentery.........	7	5	3	6
21	Measles	9	6	2	10	Whooping-cough..	14	8	2	2	Puerperal fever...	5	3	3	3
22	Cholera infantum.	3	1	1	1	Cerebro-spi. men..	4	2	2	4	Smallpox.........	0.7	0.6	2	0.2
23	Cerebro-spi. men..	3	1	1	1	Typhoid fev. (ent.)	7	5	2	5	Whooping-cough..	14	9	2	5
24	Cholera morbus. .	3	3	1	2	Membran. croup..	7	4	2	1	Inflam. of brain...	5	4	1	2
25	Typho-mal. fever..	11	4	0.8	2	Cholera infantum.	1	1	1	0.5	Cholera morbus...	4	3	1	2
26	Puerperal fever...	5	4	0.8	1	Cholera morbus...	4	3	0.5	2	Membran. croup..	5	3	0.6	1
27	Membran. croup..	8	4	0.5	1	Typho-mal. fever..	9	2	0.5	0.8	Cholera infantum.	2	0.9	0.4	0.7
28	Smallpox..........	1	0.4	0	0	Smallpox..........	1	0.7	0	0	Typho-mal. fever..	8	3	0	2
	Reports received§	379	405	397	338	Reports received§	350	369	374	373	Reports received§	372	391	504	451

Line number.	April. Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	May. Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	June. Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.
	Average disease.*.	26	22	18	18	Average disease*..	24	20	16	15	Average disease*.	23	19	15	14
1	Rheumatism......	73	70	67	66	Rheumatism......	70	68	63	61	Rheumatism......	66	63	63	59
2	Bronchitis	68	65	60	56	Neuralgia..........	64	60	57	53	Neuralgia..........	60	56	53	46
3	Neuralgia..........	69	66	60	58	Bronchitis	58	54	53	47	Bronchitis	49	46	37	38
4	Influenza..........	56	62	57	65	Tonsillitis.........	46	46	41	38	Diarrhea	41	36	37	29
5	Tonsillitis.........	53	52	50	46	Influenza..........	40	44	33	50	Tonsillitis.........	38	37	33	32
6	Diarrhea	29	26	27	17	Diarrhea	32	28	23	20	Consumption, pul.	50	35	24	22
7	Pneumonia.........	43	33	26	29	Inflam. of kidney..	22	21	21	12	Influenza..........	27	27	20	32
8	Inflam. of kidney..	23	22	24	18	Consumption, pul.	51	37	20	22	Inflam. of kidney..	20	20	19	16
9	Consumption, pul.	54	40	21	22	Intermittent fev..	52	27	19	19	Intermittent fev..	54	28	19	17
10	Pleuritis	22	22	19	22	Pleuritis	18	18	16	17	Remittent fever..	34	19	11	12
11	Intermittent fev..	49	27	19	17	Pneumonia.........	32	24	15	20	Pleuritis	14	14	11	12
12	Inflam. of bowels..	12	11	11	9	Measles	22	16	14	10	Cholera morbus...	16	12	10	8
13	Remittent fever..	31	17	11	11	Remittent fever..	32	18	11	11	Measles	18	15	10	14
14	Measles	19	15	11	17	Erysipelas.........	22	17	9	11	Inflam. of bowels..	14	13	10	9
15	Scarlet fever......	16	11	11	5	Scarlet fever.....	14	10	7	5	Erysipelas.........	16	16	9	11
16	Erysipelas.........	24	19	9	15	Inflam. of bowels..	12	11	7	9	Dysentery.........	12	9	8	6
17	Cerebro-spi. men..	4	2	7	2	Cerebro-spi. men..	4	2	6	2	Typhoid fev. (ent.)	5	5	7	3
18	Inflam. of brain...	5	4	5	3	Cholera morbus...	7	6	4	4	Cholera infantum.	9	7	6	6
19	Dysentery.........	7	5	3	2	Typhoid fev. (ent.)	4	3	4	2	Pneumonia........	19	12	6	9
20	Cholera morbus...	5	4	3	2	Dysentery.........	7	6	4	2	Scarlet fever......	12	9	5	3
21	Typhoid fev. (ent.)	4	3	3	5	Diphtheria........	11	5	3	2	Cerebro-spi. men..	3	2	4	3
22	Puerperal fever...	4	4	2	5	Puerperal fever...	4	3	3	2	Whooping-cough..	14	9	3	4
23	Cholera infantum.	2	1	2	1	Whooping-cough .	14	10	2	6	Diphtheria.........	10	5	2	3
24	Smallpox..........	0.9	0.3	2	0.3	Inflam. of brain..	5	4	1	2	Puerperal fever ..	5	4	2	2
25	Diphtheria........	12	5	2	3	Cholera infantum.	3	3	0.7	1	Inflam. of brain...	5	4	1	3
26	Whooping-cough..	13	10	1	5	Membran. croup..	4	2	0.6	0.4	Typho-mal. fever..	8	2	1	0.5
27	Membran. croup..	5	3	0.3	1	Typho-mal. fever .	7	3	0	1	Smallpox..........	1	0.2	0.2	0
28	Typho-mal. fever..	8	3	0	0.6	Smallpox..........	1.1	0.1	0	0	Membran. croup..	2	1	0	0.2
	Reports received§	321	336	380	337	Reports received§	372	399	541	446	Reports received§	379	407	452	556

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*, †. These notes are on the preceding page. §The numbers in this line
‡Statements in this exhibit for months in 1899, are graphically represented in Diagrams 1 to 5,

of the reports received the diseases were stated to be present in each of the years 1898
years, 1877-98, and for the period of 10 years, 1889-98.

What per cent of the reports received stated presence of the disease.

July.					August.					September.					
Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	Line number.
Average disease*..	24	19	17	15	Average disease*.	27	22	17	18	Average disease*.	27	22	19	18	
Rheumatism	60	60	64	55	Diarrhea	80	74	68	65	Diarrhea	76	71	72	67	1
Diarrhea...........	66	58	53	48	Rheumatism......	57	57	57	55	Rheumatism.....	60	59	63	57	2
Neuralgia..........	56	53	50	39	Neuralgia....... ..	55	52	47	46	Neuralgia..........	56	53	54	46	3
Bronchitis	41	38	38	33	Dysentery	46	37	39	33	Dysentery	43	37	43	32	4
Tonsillitis	32	33	30	28	Cholera morbus...	50	42	32	36	Bronchitis	46	44	43	41	5
Consumption, pul.	48	35	25	24	Bronchitis	40	39	32	38	Tonsillitis.........	35	34	34	33	6
Cholera morbus...	38	29	25	22	Cholera infantum	41	35	31	28	Cholera morbus...	36	34	28	31	7
Dysentery	26	19	23	16	Tonsillitis.........	32	33	27	29	Cholera infantum.	33	31	24	26	8
Intermittent fever	56	31	23	20	Intermittent fev.	57	34	21	26	Consumption, pul.	52	34	21	19	9
Inflam. of kidney..	18	18	19	15	Consumption, pul.	47	34	19	20	Intermittent fev.	56	33	18	26	10
Cholera infantum.	27	21	17	18	Inflam. of bowels.	19	18	16	15	Inflam. of kidney.	16	16	18	16	11
Influenza	19	19	14	20	Inflam. of kidney.	17	16	16	17	Remittent fever..	43	27	17	21	12
Remittent fever..	36	22	13	15	Influenza	19	19	15	20	Influenza..........	27	26	17	27	13
Inflam. of bowels..	16	14	13	13	Remittent fever..	41	25	14	18	Inflam. of bowels.	16	15	14	14	14
Pleuritis...........	11	11	11	10	Typhoid fev. (ent.)	13	14	12	10	Typhoid fev. (ent.)	19	18	14	14	15
Measles	11	8	9	8	Erysipelas.........	16	12	9	7	Pleuritis	11	11	9	8	16
Erysipelas..........	17	14	8	9	Pleuritis	9	9	7	8	Pneumonia.......	13	9	6	8	17
Typhoid fev. (ent.)	7	7	7	6	Whooping-cough .	16	11	4	6	Scarlet fever.....	10	7	6	3	18
Scarlet fever......	10	7	5	5	Measles	5	4	4	4	Whooping-cough .	15	9	5	4	19
Whooping-cough..	17	11	4	5	Scarlet fever......	9	6	4	4	Erysipelas.........	15	12	5	9	20
Pneumonia.........	12	8	3	5	Pneumonia........	10	7	2	3	Diphtheria........	10	5	3	2	21
Typho-mal. fever..	10	4	3	2	Typho-mal. fever.	17	8	2	2	Measles	3	2	3	2	22
Cerebro-spi. men..	3	2	3	3	Puerperal fever..	4	2	1	3	Typho-mal. fever.	25	10	2	6	23
Puerperal fever...	4	3	2	2	Inflam. of brain...	5	3	0.8	1	Cerebro-spi. men.	3	2	2	3	24
Inflam. of brain...	5	4	1	3	Diphtheria	10	4	0.6	0.6	Puerperal fever..	3	2	1	1	25
Membran. croup...	1	1	0.2	0.2	Cerebro-spi. men.	3	2	0.2	2	Membran. croup..	2	0.9	0.5	0	26
Diphtheria.........	9	4	0	0.7	Membran. croup..	2	0.6	0	0	Inflam. of brain..	4	3	0.5	2	27
Smallpox	0.7	0.1	0	0	Smallpox	0.4	.05	0	0	Smallpox	0.2	.03	0	0	28
Reports received§.	401	438	404	455	Reports received§	418	445	488	519	Reports received§	397	430	385	451	

October.					November.					December.					
Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.‡	1898.	Line number.
Average disease*..	26	21	17	18	Average disease*.	25	20	17	17	Average disease*.	25	20	17	18	
Rheumatism	65	63	65	62	Rheumatism......	68	65	60	63	Rheumatism......	70	66	68	63	1
Neuralgia..........	60	57	56	54	Neuralgia..........	64	60	58	59	Neuralgia..........	65	61	61	60	2
Bronchitis	53	51	48	52	Bronchitis	62	58	52	59	Bronchitis	66	62	59	64	3
Diarrhea...........	53	52	47	49	Tonsillitis.........	53	51	49	47	Tonsillitis.........	57	55	56	50	4
Tonsillitis..........	44	43	40	40	Influenza	42	44	35	48	Influenza	53	60	47	63	5
Influenza	32	32	24	31	Diarrhea...........	33	29	31	28	Diarrhea	26	24	26	25	6
Consumption, pul.	47	33	22	19	Consumption, pul.	47	33	26	22	Consumption, pul.	47	33	26	20	7
Typhoid fev. (ent.)	21	21	21	15	Inflam. of kidney.	19	19	23	19	Pleuritis	20	20	19	17	8
Intermittent fever	54	31	21	25	Pleuritis	16	16	18	15	Inflam. of kidney.	19	18	18	21	9
Dysentery	23	22	18	21	Typhoid fev. (ent.)	18	16	18	13	Pneumonia	36	28	15	22	10
Inflam. of kidney..	18	17	17	18	Intermittent fev.	48	27	17	22	Erysipelas.........	21	17	12	14	11
Remittent fever..	42	26	16	18	Remittent fever..	35	22	12	13	Intermittent fev..	41	22	11	12	12
Cholera morbus...	14	14	11	16	Pneumonia........	27	21	12	16	Remittent fever..	30	19	10	13	13
Pleuritis...........	13	13	10	11	Erysipelas.........	19	15	11	13	Typhoid fev. (ent.)	12	10	10	7	14
Inflam. of bowels..	13	13	9	10	Scarlet fever......	14	11	8	8	Inflam. of bowels..	12	11	8	11	15
Cholera infantum.	12	12	8	12	Inflam. of bowels.	12	10	8	6	Whooping-cough .	13	8	8	7	16
Pneumonia	18	14	7	11	Dysentery	10	8	6	5	Scarlet fever.....	14	11	6	8	17
Erysipelas	18	13	6	12	Whooping-cough .	13	8	5	7	Measles............	6	4	6	2	18
Scarlet fever......	12	10	6	5	Cholera morbus..	6	5	4	3	Dysentery	6	5	4	3	19
Diphtheria	17	8	5	4	Diphtheria........	18	9	3	5	Diphtheria	17	8	4	5	20
Whooping-cough ..	13	7	5	2	Cholera infantum.	3	2	3	0.6	Cholera morbus ..	4	3	2	2	21
Puerperal fever...	4	3	3	1	Measles	5	3	3	0	Inflam. of brain..	4	3	1	2	22
Typho-mal. fever..	27	11	3	6	Puerperal fever..	4	3	2	1	Typho-mal. fever.	13	4	1	4	23
Cerebro-spi. men..	3	1	2	1	Membran. croup..	6	3	2	0.4	Cerebro-spi. men.	3	1	1	1	24
Measles	3	2	2	0.5	Typho-mal. fever.	20	6	1	4	Membran. croup..	7	3	1	0	25
Membran. croup...	4	2	0.8	0.5	Cerebro-spi. men.	2	1	1	0.8	Cholera infantum	2	1	0.6	0.3	26
Smallpox...........	0.3	0.2	0.5	0	Inflam. of brain...	4	3	0.4	0.2	Puerperal fever..	4	3	0.3	0.3	27
Inflam. of brain...	4	3	0.3	0.2	Smallpox..........	0.4	0.1	0.2	0	Smallpox..........	0.4	0.1	0	0	28
Reports received§.	406	437	370	418	Reports received§	388	424	468	481	Reports received§	388	410	363	394	

state how many reports were received for the month in the given years.
in this article.

EXHIBIT II.—*By months and by geographical divisions of the State,* the names of 214 observers, whose weekly reports of diseases for 1899 are compiled in Tables 1, 2, 3 and 4, the localities*a *for which they report, and the number of reports received from each observer.*

Divisions and localities represented and physicians who reported. (Voluntary observers in italics.)	Weekly reports in 1899.—Compiled in this article.												
	Year, 1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All localities	5,126	397	374	504	380	541	452	404	488	385	370	468	363
Upper Peninsula Division	**214**	**15**	**10**	**19**	**14**	**24**	**27**	**17**	**17**	**18**	**16**	**22**	**15**
Crystal Falls, R. H. Darling, M. D.	13	....	....	....	....	....	4	3	3	3	....	....	....
Escanaba, A. C. Cholette. M. D.	7	....	....	3	4	....	....	....	....	....	....	....	....
Escanaba, A. F. Snyder, M. D.	6	....	....	....	....	3	3	....	....	....	....	....	....
Gladstone, R. S. Forsyth, M. D.	3	....	....	3	....	....	....	....	....	....	....	....	....
Ironwood, C. S. Jones, M. D.	7	....	....	....	....	4	3	....	....	....	....	....	....
Ishpeming, *G. G. Barnett, M. D.*	4	4	....	....	....	....	....	....	....	....	....	....	....
Marquette, F. McD. Harkin, M. D.	32	....	....	....	....	3	4	4	4	4	4	5	4
Ontonagon, J. S. Nitterauer, M. D.	23	....	....	....	....	5	3	....	....	3	4	5	3
Red Jackett, C. J. Sorsen, M. D.	7	....	....	....	....	....	2	2	....	....	....	3	....
Rockland Tp., *W. C. Gates, M. D.*	12	3	2	4	3	....	....	....	....	....	....	....	....
Sault Ste. Marie, J. S. Griffin, M. D.	33	....	....	....	....	4	4	4	5	4	4	4	4
Sault Ste. Marie, B. D. Harison, M. D.	15	4	4	4	3	....	....	....	....	....	....	....	....
Wakefield, J. H. Eddy, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Northwestern Division	**216**	**16**	**13**	**17**	**13**	**21**	**18**	**18**	**24**	**20**	**15**	**24**	**17**
Bear Lake, C. A. Norconk, M. D.	19	....	....	....	....	....	2	....	4	3	3	5	2
Benzonia, *E. J. C. Ellis, M. D.*	22	....	....	....	....	....	3	3	4	3	....	5	4
Cadillac, D. Ralston, M. D.	13	2	2	4	2	3	....	....	....	....	....	....	....
Fife Lake, L. S. Walter, M. D.	46	4	4	4	3	4	3	4	4	4	4	4	4
Harrietta, G. B. Hamilton, M. D.	4	....	....	....	....	4	....	....	....	....	....	....	....
Kingsley, G. L. Fenton, M. D.	45	3	3	4	4	5	3	3	4	4	4	5	3
Manistee, E. S. Ellis, M. D.	14	....	....	....	....	....	3	4	4	3	....	....	....
Manton, T. A. Corlett, M. D.	50	4	4	5	4	5	4	4	4	3	4	5	4
Sherman, E. A. McManus, M. D.	3	3	....	....	....	....	....	....	....	....	....	....	....
Northern Division	**303**	**30**	**22**	**32**	**30**	**31**	**28**	**21**	**23**	**22**	**23**	**23**	**18**
Bellaire, W. S. Bell, M. D.	12	4	....	4	4	....	....	....	....	....	....	....	....
Boardman, S. E. Neihardt, M. D.	10	3	....	4	3	....	....	....	....	....	....	....	....
Boyne City, A. J. DeLacy, M. D.	46	4	4	5	4	5	4	3	5	4	4	....	4
Charlevoix, A. A. Swinton, M. D.	41	3	4	5	4	4	4	2	3	2	4	3	3
Cheboygan, C. B. Marks, M. D.	8	....	....	....	....	4	4	....	....	....	....	....	....
Cheboygan, J. W. Steffins, M. D.	16	4	4	4	4	....	....	....	...	....	....	....	....
East Jordan, F. A. Foster, M. D.	33	....	....	....	....	4	4	4	5	4	3	5	4
East Jordan, F. C. Warne, M. D.	6	4	2	....	....	....	....	....	....	....	....	....	....
Harbor Springs, L. W. Gardner, M. D.	15	4	4	5	2	....	....	....	....	....	....	....	....
Kalkaska, P. W. Pearsall, M. D.	35	....	....	....	2	4	4	4	5	4	4	5	3
Mancelona, C. Beaver, M. D.	38	....	....	....	3	5	4	4	5	4	4	5	4
Petoskey, A. G. Oven, M. D.	26	....	....	....	....	5	4	4	....	4	4	5	....
Petoskey, O. L. Ramsdell, M. D.	17	4	4	5	4	....	....	....	...	....	....	....	....
Northeastern Division	**182**	**16**	**16**	**18**	**15**	**18**	**16**	**14**	**15**	**12**	**12**	**17**	**13**
East Tawas, H. A. Goodale, M. D.	29	4	4	3	3	3	4	2	....	....	....	3	3
Harrisville, *D. W. Mitchell, M. D.*	52	4	4	5	4	5	4	4	5	4	4	5	4
Rogers City, C. W. Isaminger, M. D.	50	4	4	5	4	5	4	4	5	4	4	4	3
West Branch, W. H. Witter, M. D.	51	4	4	5	4	5	4	4	5	4	4	5	3
Northern Central Division	**292**	**14**	**15**	**30**	**22**	**29**	**32**	**27**	**32**	**23**	**20**	**28**	**20**
Beaverton, J. Kenwendeshon, M. D.	17	....	....	....	....	4	4	4	5	....	....	....	....
Beaverton, F. S. Pierce, M. D.	17	4	4	4	3	....	....	....	....	....	....	....	2
Big Rapids, W. A. Whitney, M. D.	8	....	....	....	....	....	3	2	3	....	....	....	....
Coleman, C. V. High, M. D.	7	....	....	....	....	....	4	3	....	....	....	....	....
Evart, J. M. Wilkinson, M. D.	28	3	3	3	3	3	3	....	3	2	2	3	....
Farwell, E. B. Evans, M. D.	33	....	....	....	....	3	4	4	5	4	4	5	4
Gladwin, J. W. Leininger, M. D.	43	...	....	4	4	5	4	4	5	4	4	5	4
Harrison, E. E. Bracy, M. D.	16	3	4	5	4	....	....	....	....	....	....	....	....
Hersey, G. E. Grover, M. D.	4	....	....	...	....	4	....	....	....	....	....	....	....
Lake City, D. J. Erwin, M. D.	9	2	2	5	....	....	....	....	....	....	....	....	....
Mecosta, J. Snyder, M. D.	34	2	2	4	....	....	....	4	5	4	4	5	4
Midland, H. M. Farnham, M. D.	11	....	....	....	....	....	3	2	3	3	....	....	....
Mt. Pleasant, P. E. Richmond, M. D.	25	....	....	....	4	5	3	....	....	2	3	5	3
Roscommon, J. H. Curnalia, M. D.	40	....	....	5	4	5	4	4	3	4	3	5	3

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*The counties in each division are shown in Exhibit I, in preceding reports. The distribution of localities from which reports were received during the greater portion of 1899 is shown on the map on page 172. Reprints numbers 559 and 572.

a In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

EXHIBIT II.—Continued.

Divisions and localities represented and physicians who reported. (Voluntary observers in italics.)	Weekly reports in 1899.—Compiled in this article.												
	Year, 1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Western Division	**618**	**52**	**53**	**62**	**47**	**74**	**51**	**46**	**61**	**45**	**43**	**49**	**35**
Casnovia, F. D. Hersey, M. D.	18	....	....	....	....	4	....	3	4	2	3	....	2
Cedar Springs, J. B. Dewar, M. D.	7	....	....	....	....	4	3	....	....	....	....	....	....
Custer, A. D. Kibbie, M. D.	46	3	3	5	4	3	3	4	4	4	4	5	4
Grand Haven, A. Van DerVeen, M. D.	13	4	4	5	....	....	....	....	....	....	....	....	....
Grand Haven, W. S. Walkley, M. D.	32	....	....	....	....	3	3	4	5	4	4	5	4
Grand Rapids, *A. Hazelwood, M. D.*	42	4	4	4	4	5	....	....	5	4	4	5	3
Grandville, W. A. Bryson, M. D.	17	....	....	....	....	5	4	4	4	....	....	....	....
Hart, J. A. Fleming, M. D.	18	4	4	4	3	3	....	....	....	....	....	....	....
Hart, J. H. Nicholson, M. D.	8	4	2	....	2	....	....	....	....	....	....	....	....
Holland, H. Kremers, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Lisbon, W. Cornwell, M. D.	18	....	....	....	....	....	3	3	5	4	3	....	....
Lowell, O. C. McDannell, M. D.	50	4	4	5	4	5	4	4	5	4	4	5	2
Ludington, E. N. Dundas, M. D.	17	4	4	5	4	....	....	....	....	....	....	....	....
Ludington, E. T. Fromen, M. D.	35	....	....	....	....	5	4	4	5	4	4	5	4
Luther, E. Fairbanks, M. D.	24	4	4	5	4	5	2	....	....	....	....	....	....
Pentwater, C. W. Cramer, M. D.	13	2	4	4	3	....	....	....	....	....	....	....	....
Rockford, W. H. Hessler, M. D.	25	....	....	....	....	4	4	4	4	3	2	4	....
Rockford, H. O. Sarber, M. D.	13	4	4	5	....	....	....	....	....	....	....	....	....
Sand Lake, C. J. Annes, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Scottville, W. C. Martin, M. D.	8	....	....	....	....	5	3	....	....	....	....	....	....
Sparta, B. J. Zudzense, M. D.	50	3	4	5	4	5	4	4	5	4	3	5	4
White Cloud, W. C. Derby, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Whitehall, L. W. Keyes, M. D.	8	....	....	....	3	3	2	....	...	....	....	....	....
Central Division	**1,091**	**85**	**75**	**111**	**91**	**114**	**95**	**88**	**103**	**79**	**78**	**91**	**81**
Alma, J. F. Suydam, M. D.	15	4	4	5	2	....	....	....	....	....	....	....	....
Belding, I. Ohlinger, M. D.	35	4	4	5	4	3	4	3	3	3	2	....	....
Brighton, H. M. Ptolmey, M. D.	40	3	4	5	3	3	2	2	5	4	2	3	4
Charlotte, V. J. Rickerd, M. D.	36	....	....	....	3	4	4	3	5	4	4	5	4
Charlotte, A. R. Stealy, M. D.	13	4	4	5	....	....	....	....	....	....	....	....	....
Clio, W. H. Taylor, M. D.	6	4	2	....	....	....	....	....	....	....	....	....	....
Corunna, A. R. Ball, M. D.	25	....	....	....	....	4	4	4	5	2	3	....	3
Eagle, H. N. Swaney, M. D.	13	....	....	....	....	5	4	4	....	....	....	....	....
Elsie, J. H. Travis, M. D	7	....	....	....	....	....	3	2	....	....	....	....	2
Evergreen Tp. (Montcalm Co.), *W. H. Budd, M. D.*	43	4	4	5	4	4	4	4	5	3	2	4	....
Flint, N. Bates, M. D.	13	4	4	5	....	....	....	....	....	....	....	....	....
Flushing, C. S. Wheeler, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Fowler, E. Schemer, M. D.	16	3	4	5	4	....	....	....	....	....	....	....	....
Fowlerville, A. S. Austin, M. D.	6	....	....	....	2	4	....	....	....	....	....	....	....
Gaines, E. H. Austin, M. D.	18	2	....	3	3	4	....	3	....	....	3	....	...
Grand Ledge, F. W. Judson, M. D.	24	....	....	....	....	....	2	4	5	3	3	3	4
Greenville, D. K. Black, M. D	20	....	....	....	....	3	4	2	....	4	3	....	4
Greenville, H. L. Bower, M. D.	15	4	4	4	3	....	....	....	....	....	....	....	....
Hamburg Tp., *J. N. Swartz, M. D.*	52	4	4	5	4	5	4	4	5	4	4	5	4
Hastings, G. W. Lowry, M. D.	31	3	4	....	2	5	2	3	3	3	....	3	3
Howard City, J. Totten, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Ionia, H. Tremayne, M. D.	33	....	....	....	2	5	4	2	3	4	4	5	4
Laingsburg, R. H. Scott, M. D.	14	....	....	4	3	3	2	....	....	....	....	....	2
Lakeview, J. W. Kirtland, M. D.	23	4	....	3	4	5	3	....	....	....	4	....	....
Lansing, *P. A. Tyler, M. D.*	49	4	3	5	4	5	4	4	4	3	4	5	4
Linden, M. E. Topping, M. D.	33	4	4	5	4	4	....	....	....	....	4	5	3
Lyons, D. C. Spaulding, M. D.	51	4	4	5	4	5	4	4	5	4	4	5	3
Maple Rapids, R. H. Sanborn, M. D.	6	....	....	....	....	....	....	3	3	....	....	....	....
Mason, F. E. Thomas, M. D.	25	....	....	5	4	3	4	4	5	....	....	....	....
McBride, D. C. Bell, M. D.	50	2	4	5	4	5	4	4	5	4	4	5	4
Middleville, A. L. Taylor, M. D.	3	....	....	....	....	3	....	....	....	....	....	....	....
Nashville, E. T. Morris, M. D.	30	....	....	....	....	....	4	4	5	4	4	5	4
Olivet, *C. Mead, M. D.*	7	....	....	....	....	....	....	..	3	4	....	....	....
Ovid, J. E. Taylor, M. D.	36	4	4	5	4	4	4	4	5	2	....	....	....
Perrinton, E. C. VanDeeor, M. D.	50	4	4	3	4	5	4	4	5	4	4	5	4
Potterville, E. R. Espie, M. D.	42	4	....	5	3	....	4	4	5	4	4	5	4
Potterville, L. E. Higbee, M. D.	5	....	....	....	....	5	....	....	....	....	....	....	....
Putnam Tp., *C. L. Sigler, M. D.*	8	....	....	....	....	....	....	....	....	....	....	5	3
Sheridan, R. H. Blaisdell, M. D.	5	....	....	....	....	5	....	....	....	....	....	....	....
Stanton, N. E. Bachman, M. D.	7	4	....	....	3	....	....	....	....	....	....	....	....
Stanton, A. L. Corey, M. D.	25	....	....	....	....	....	3	3	5	4	4	3	3
St. Johns, J. W. Pollard, M. D.	21	....	....	....	....	....	....	....	4	4	4	5	4
St. Johns, M. Weller, M. D.	9	....	....	....	....	3	4	2	....	....	....	....	....
Thornapple Tp., *L. P. Parkhurst, M. D.*	8	....	....	....	....	....	....	....	....	....	....	5	3
Vermontville, C. S. Snell, M. D.	13	....	2	5	4	....	2	....	....	....	....	....	....
Westphalia, G. J. Schaller, M. D.	6	....	....	4	2	....	....	....	....	....	....	....	....

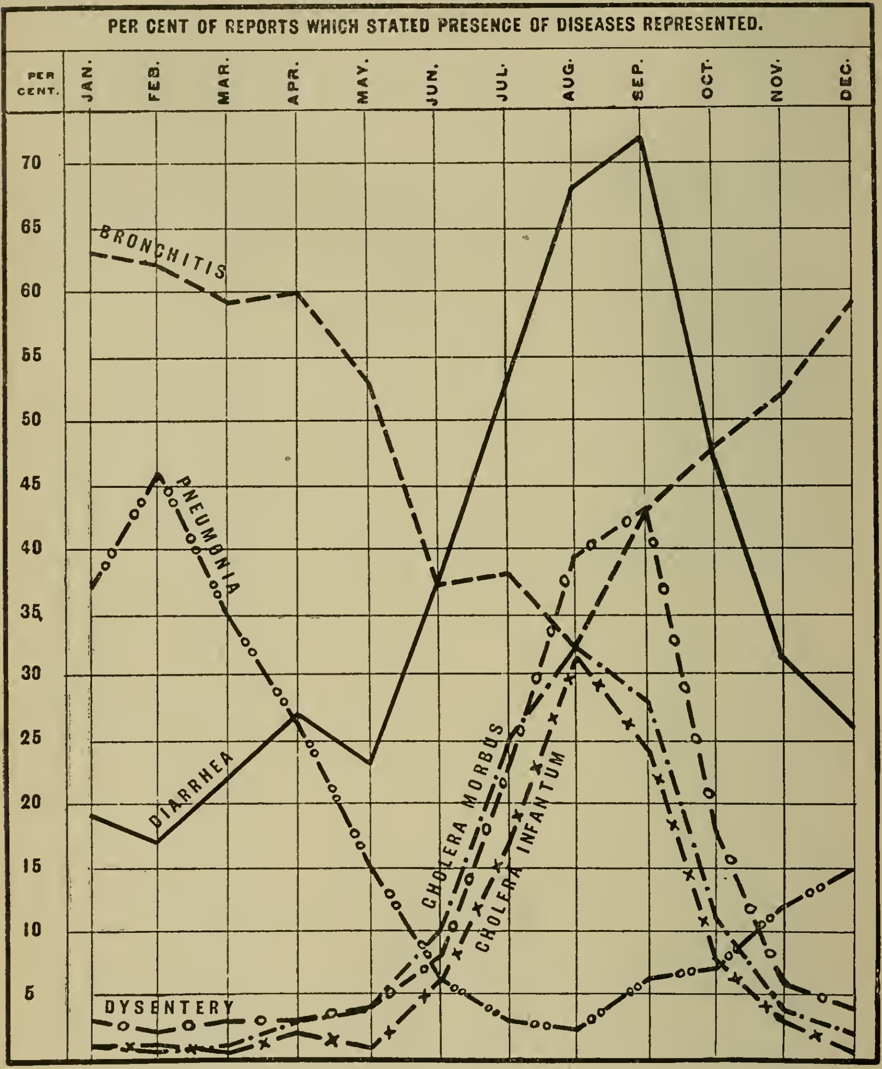
EXHIBIT II.—CONTINUED.

Divisions and localities represented and physicians who reported. (Voluntary observers in italics.)	Weekly reports in 1899.—Compiled in this article.												
	Year, 1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division	**542**	**55**	**50**	**59**	**43**	**46**	**31**	**37**	**51**	**42**	**36**	**47**	**45**
Algonac, W. E. Bostwick, M. D.	4	....	....	....	....	....	....	....	4	....	....	....	....
Almont, D. H. Burley, M. D.	48	4	3	4	3	5	4	4	4	4	4	5	4
Brown City, J. W. Weed, M. D.	32	3	4	4	4	....	2	3	4	2	....	3	3
Cass City, M. M. Wickware, M. D.	17	....	....	....	....	3	....	2	4	3	2	....	3
Chesaning, D. W. Mudge, M. D.	23	4	4	5	4	4	2	....	....	....	....	....	....
Columbiaville, E. Conley, M. D.	16	3	4	5	4	....	....	....	....	....	....	....	....
Croswell, T. S. Kingston, M. D.	19	4	4	5	2	....	....	....	....	....	....	....	4
Deckerville, *H. F. Alderton, M. D.*	18	3	3	4	4	4	....	....	....	....	....	....	....
Deckerville, G. C. Vincent, M. D.	25	....	....	....	2	3	3	3	4	....	2	4	4
Emmett, W. C. Martin, M. D.	9	3	....	....	....	....	....	....	....	2	2	....	2
Fremont Tp. (Tuscola Co.), *B. D'Arcy, M. D.*	30	4	4	....	2	....	....	....	4	4	4	5	3
Lapeer, J. V. Frazier, M. D.	3	3	....	....	....	....	....	....	....	....	....	....	....
Lexington, L. T. Schurrer, M. D.	50	4	4	5	2	5	4	4	5	4	4	5	4
Marine City, A. B. Armsbury, M. D.	37	4	3	5	4	....	2	2	3	4	2	5	3
Oakley, T. H. O'Rourke, M. D.	32	....	....	....	....	3	4	4	4	4	4	5	4
Reese, J. MacKinzie, M. D.	51	4	4	5	4	5	4	4	5	4	4	5	3
Sebewaing, N. J. Pike, M. D.	5	....	2	3	....	....	....	....	....	....	....	....	....
St. Charles, G. A. Smale, M. D.	7	....	....	....	....	....	....	3	....	4	....	....	....
Thornville, *J. S. Caulkins, M. D.*	50	4	4	4	4	5	4	4	5	3	4	5	4
Vassar Tp., *F. D. LeValley, M. D.*	12	4	3	5	....	....	....	....	....	....	....	....	....
West Bay City, F. L. Tupper, M. D.	22	4	4	5	4	5	....	....	....	....	....	....	....
Yale, B. Clyne, M. D.	32	....	....	....	....	4	2	4	5	4	4	5	4
Southwestern Division	**367**	**33**	**30**	**43**	**25**	**44**	**36**	**33**	**27**	**23**	**27**	**30**	**16**
Allegan, D. Calkins, M. D.	41	4	2	4	4	5	3	2	....	4	4	5	4
Benton Harbor, G. M. Bell, M. D.	14	3	4	4	3	....	....	....	....	....	....	....	....
Benton Harbor, W. Ryno, M. D.	15	....	....	....	....	3	4	4	4	....	....	....	....
Berrien Springs, A. J. McLaughlin, M. D.	8	2	2	4	....	....	....	....	....	....	....	....	....
Buchanan, J. I. Garland, M. D.	24	4	4	5	4	5	2	....	....	....	....	....	....
Douglas, H. A. Stroud, M. D.	46	4	....	5	3	5	4	4	4	4	4	5	4
Fennville, W. H. Andrews, M. D.	19	....	2	5	3	3	4	2	....	....	....	....	....
Gobleville, J. J. Carpenter, M. D.	7	4	3	....	....	....	....	....	....	....	....	....	....
Hartford, R. R. Lawrence, M. D.	7	....	....	....	....	....	....	....	....	....	4	3	....
Niles, J. D. Greenamyer, M. D.	31	....	....	....	....	4	4	4	4	4	3	4	4
Otsego, J. W. Toan, M. D.	8	....	....	....	....	3	2	3	....	....	....	....	....
Paw Paw, C. S. Maynard, M. D.	10	....	....	....	....	3	2	3	....	....	2	....	....
Plainwell, C. M. Stuck, M. D.	25	....	2	....	....	3	3	3	5	3	2	4	....
Saugatuck, H. H. Stimson, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
South Haven, M. Springer, M. D.	11	4	4	3	....	....	....	....	....	....	....	....	....
Vandalia, C. H. Fox, M. D.	8	2	3	3	....	....	....	....	....	....	....	....	....
Watervliet, W. L. Garratt, M. D.	41	2	....	5	4	5	4	4	5	4	4	4	....
Southern Central Division	**870**	**55**	**59**	**69**	**55**	**95**	**83**	**70**	**91**	**70**	**67**	**89**	**67**
Albion, A. G. Bruce, M. D.	32	....	....	....	....	4	4	4	5	2	4	5	4
Ann Arbor, E. A. Clark, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Augusta, C. E. Doyle, M. D.	51	3	4	5	4	5	4	4	5	4	4	5	4
Blissfield, C. E. Howland, M. D.	12	....	4	5	3	....	....	....	....	....	....	....	....
Britton, E. E. Hendershott, M. D.	3	....	....	3	....	....	....	....	....	....	....	....	....
Burr Oak, R. Crofford, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Clayton, S. H. Jurden, M. D.	8	....	....	....	....	5	3	....	....	....	....	....	....
Clinton, J. L. Tuttle, M. D.	29	....	....	....	....	3	3	4	5	4	4	4	2
Clinton, J. E. White, M. D.	8	4	4	....	....	....	....	....	....	....	....	....	....
Comstock Tp., *W. L. McBeth, M. D.*	25	....	....	....	....	4	4	....	4	3	3	5	2
Concord, L. N. Keeler, M. D.	7	3	4	....	....	....	....	....	....	....	....	....	....
Concord, F. S. Tuthill, M. D.	28	....	....	....	....	5	4	4	4	3	4	4	....
Constantine, C. F. Gustin, M. D.	35	....	....	....	4	5	3	2	5	4	3	5	4
Constantine, D. E. Thomas, M. D.	48	4	4	5	2	4	4	4	5	4	4	5	3
Deerfield, W. Bliss, M. D.	52	4	4	5	4	5	4	4	5	4	4	5	4
Dexter, E. F. Chase, M. D.	3	....	....	....	....	3	....	....	....	....	....	....	....
Galesburg, W. A. Burdick, M. D.	27	3	....	....	....	....	4	3	4	4	2	3	4
Hanover, A. L. Ambrose, M. D.	39	....	....	4	4	4	4	4	5	4	2	4	4
Homer, J. A. Thompson, M. D.	34	....	....	....	....	5	4	4	5	4	3	5	4
Jackson, J. T. Main, M. D.	20	4	4	3	4	3	2	....	....	....	....	....	....
Kalamazoo, A. Hochstein, M. D.	5	....	....	3	2	....	....	....	....	....	....	....	....
Litchfield, W. H. Atterbury, M. D.	10	3	4	3	....	....	....	....	....	....	....	....	....
Marshall, F. M. Foote, M. D.	50	4	4	5	4	5	3	4	5	3	4	5	4
Mendon, G. W. Nihart, M. D.	3	3	....	....	....	....	....	....	....	....	....	....	....
Mendon, W. A. Royer, M. D.	7	....	....	....	....	....	4	3	....	....	....	....	....
Sturgis, J. C. Curts, M. D.	33	....	....	....	....	4	3	4	5	4	4	5	4
Sturgis, W. M. Hoskinson, M. D.	16	4	4	4	4	....	....	....	....	....	....	....	....
Tecumseh, P. B. Hardy, M. D.	4	....	....	....	2	....	2	....	....	....	....	....	....
Tecumseh, *J. F. Jenkins, M. D.*	45	3	4	5	4	4	4	2	5	3	3	4	4
Three Rivers, P. E. Wagar, M. D.	4	....	....	....	....	4	....	....	....	....	....	....	....

EXHIBIT II.—CONCLUDED.

Divisions and localities represented and physicians who reported. (Voluntary observers in italics.)	Weekly reports in 1899.—Compiled in this article.												
	Year, 1899.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southern Central Division.—Continued.													
Union City, W. C. Henderson, M. D......	50	2	4	5	4	5	4	4	5	4	4	5	4
White Pigeon, W. C. Cameron, M. D.....	44	3	3	4	2	4	4	4	4	4	3	5	4
Ypsilanti, C. R. Wilcoxson, M. D.........	34	....	....	....	....	4	4	4	5	4	4	5	4
Southeastern Division.....................	**431**	**26**	**31**	**44**	**25**	**45**	**35**	**33**	**44**	**31**	**33**	**48**	**36**
Dearborn, R. S. Law, M. D................	9	....	....	....	....	4	....	....	....	....	....	3	2
Delray, A. I. Burdino, M. D................	3	....	....	3	....	....	....	....	....	....	....	....	....
Delray, B. G. Monkman, M. D............	11	....	....	....	3	3	2	....	....	....	....	3	....
Dundee, E. E. Richardson, M. D..........	8	....	2	3	....	....	....	....	....	....	3	....	....
Highland Park, A. Stewart, M. D.........	52	4	4	5	4	5	4	4	5	4	4	5	4
Holly, D. D. Bartholomew, M. D..........	35	....	....	....	....	5	4	4	5	4	4	5	4
Memphis, D. H. Cole, M. D...............	13	4	4	5	....	....	....	....	....	....	....	....	....
Memphis, E. D. Mills, M. D...............	30	....	....	....	3	....	4	3	4	3	4	5	4
Mt. Clemens, A. J. Warren, M. D.........	33	....	....	....	....	5	4	4	5	4	3	4	4
New Haven, A. Gunn, M. D..............	13	4	4	5	....	....	....	....	....	....	....	....	....
Northville, T. B. Henry, M. D.............	20	....	....	....	....	5	4	4	5	2	....	....	....
Plymouth, F. B. Adams, M. D............	49	4	3	4	4	5	4	4	4	4	4	5	4
Pontiac, *M. W. Gray, M. D.*..............	9	....	....	....	....	....	....	....	....	....	....	5	4
Richmond, F. T. Fenton, M. D............	52	4	4	5	4	5	4	4	5	4	4	5	4
Romeo, W. Greenshields, M. D...........	34	4	4	4	2	4	....	3	4	3	3	....	3
Springwells Tp., *T. Schmalzriedt, M. D.*	7	....	....	....	....	....	....	....	....	....	....	4	3
Trenton, A. O. Osborn, M. D..............	6	....	3	3	....	....	....	....	....	....	....	....	....
Wayne, H. E. Foster, M. D................	15	....	....	3	3	4	2	....	3	....	....	....	....
Wyandotte, W. C. Lambert, M. D........	21	...	....	....	....	....	3	3	4	3	4	4	....
Wyandotte, N. T. Langlois, M. D.........	11.	2	3	4	2	....	....	....	....	....	....	....	....

DIAGRAM I—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1899.



[PLATE 1062.]

TABLE 1.—*Stating for each of 11 years, 1889-1899, the number and per cent of observers by whom the following diseases were reported present; also an average for the period of 22 years, 1877-1898, and an average for the period of 10 years, 1889-1898. The diseases are arranged in order of greatest number of observers who reported them present in 1899.* (Continued for each month of 1898 and 1899 on the two pages following.)*

Line number.	Diseases.	Observers by whom the several diseases were reported present—average per cents (per month) of those making reports.‡												
		Av. 1877-98.†	Av. 1889-98.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.
	Av. for tabulated diseases reported present........	36	31	26	26	27	21	30	30	31	33	37	37	36
1	Rheumatism................	82	81	74	76	81	78	78	78	80	83	86	87	82
2	Neuralgia....................	79	77	69	70	74	74	74	74	76	80	83	85	82
3	Bronchitis	73	71	64	65	66	70	69	67	72	73	75	81	75
4	Tonsillitis..................	69	69	63	60	64	70	66	64	71	71	74	75	71
5	Diarrhea ...:.................	63	61	55	55	53	55	60	58	61	63	67	68	65
6	Influenza....................	55	59	53	59	61	59	58	55	57	56	69	67	49
7	Pneumonia..................	48	40	31	33	36	34	36	36	37	43	40	50	47
8	Pleuritis	32	32	30	29	30	32	32	28	27	35	36	35	33
9	Inflam. of kidney..........	33	32	30	29	30	29	33	31	29	36	36	36	35
10	Consumption, pul..........	58	43	28	25	25	29	35	43	47	49	60	62	59
11	Intermittent fever.........	62	41	28	32	27	31	35	36	37	43	52	58	61
12	Dysentery..................	30	27	23	23	24	23	28	27	25	29	30	31	33
13	Inflam. of bowels...........	28	27	21	24	24	23	25	27	25	28	31	29	29
14	Remittent fever............	47	32	21	22	20	27	32	31	28	34	43	40	45
15	Erysipelas..................	38	32	20	25	27	26	28	27	29	34	39	43	43
16	Cholera morbus............	29	26	19	23	21	23	26	27	26	29	31	29	27
17	Cholera infantum..........	21	19	14	16	14	15	22	20	18	21	23	21	21
18	Scarlet fever................	23	17	14	9	8	14	19	24	19	22	17	18	18
19	Typhoid fever (ent.)	18	16	14	14	11	16	21	18	15	15	16	14	17
20	Measles......................	17	14	12	12	22	12	8	11	14	7	17	22	12
21	Cerebro-spi. men...........	7	5	7	6	3	4	2	4	5	5	6	8	7
22	Whooping-cough	21	15	6	8	7	12	14	18	15	18	16	17	25
23	Diphtheria..................	23	12	5	6	10	10	10	13	13	15	13	16	12
24	Puerperal fever............	10	8	5	5	7	6	7	6	9	11	8	9	13
25	Inflam. of brain............	11	9	5	5	6	7	8	9	8	9	11	12	13
26	Typho-mal. fever...........	22	10	3	5	2	6	8	8	9	10	12	14	26
27	Membran. croup............	10	6	2	2	3	2	4	5	5	8	10	11	7
28	Smallpox....................	1	0.4	0.7	0.1	.09	1	0.5	1	0.3	.08	0	0.2	0.5
	No. of observers............	§153	§175	213	217	167	144	185	189	205	199	145	155	139
	Av. No. of observers per month.	93	102	111	114	95	82	94	116	113	109	91	102	100

*For 1899 the names of the observers and the number of the reports received from each are stated in Exhibit II.

†‡Foot-notes are on page 77.

§Averages per year.

TABLE 1.—Continued.—*Per cent of observers by whom the several diseases were for the period of 22 years, 1877-98, and*

Line number.	Per cent of observers by whom the diseases were reported present.‡														
	January.					February.					March.				
	Diseases.	Av.'77-98.†	Av.'89-98.	1899.	1898.	Diseases.	Av.'77-98.†	Av.'89-98.	1899.	1898.	Diseases.	Av.'77-98†	Av.'89-98.	1899.	1898.
	Average	37	32	25	26	Average	36	31	26	26	Average	37	32	28	29
1	Influenza	74	82	94	80	Influenza	76	84	96	80	Influenza	77	86	89	84
2	Bronchitis	83	80	76	73	Bronchitis	84	80	73	72	Rheumatism	85	84	81	87
3	Rheumatism	86	84	72	82	Rheumatism	84	82	72	83	Bronchitis	84	81	75	71
4	Tonsillitis	79	79	69	67	Neuralgia	83	82	71	80	Tonsillitis	78	77	72	71
5	Neuralgia	82	81	68	77	Tonsillitis	77	75	69	68	Neuralgia	85	83	68	82
6	Pneumonia	71	64	59	48	Pneumonia	72	63	64	53	Pneumonia	71	61	63	59
7	Pleuritis	43	43	37	42	Pleuritis	41	40	35	39	Diarrhea	47	46	46	39
8	Diarrhea	46	46	35	41	Diarrhea	44	43	32	44	Pleuritis	42	42	41	42
9	Inflam. of kidney	34	33	32	34	Erysipelas	41	34	27	27	Inflam. of kidney.	36	35	38	31
10	Erysipelas	42	34	23	26	Inflam. of kidney.	36	34	26	30	Erysipelas	42	37	28	34
11	Consumption, pul.	59	45	23	16	Scarlet fever	26	16	22	12	Consumption, pul.	61	45	25	23
12	Intermittent fev.	54	33	21	20	Consumption, pul.	59	43	21	22	Intermittent fev.	56	33	24	29
13	Scarlet fever	29	22	21	11	Intermittent fev.	53	31	20	18	Scarlet fever	28	18	19	6
14	Inflam. of bowels	24	23	17	22	Remittent fever	43	24	17	13	Inflam. of bowels.	27	24	18	25
15	Remittent fever	41	26	14	17	Inflam. of bowels.	23	21	15	19	Cerebro-spi. men.	9	6	18	3
16	Dysentery	15	14	9	12	Inflam. of brain	12	10	8	8	Remittent fever	40	24	17	16
17	Inflam. of brain	10	8	7	4	Diphtheria	25	12	8	11	Measles	24	19	15	18
18	Typhoid fev. (ent.)	15	12	5	12	Measles	19	15	7	11	Diphtheria	23	11	10	10
19	Whooping-cough	22	15	5	4	Cerebro-spi. men.	8	6	7	11	Dysentery	14	12	10	16
20	Measles	16	12	5	17	Puerperal fever	10	8	6	3	Puerperal fever	12	8	10	8
21	Diphtheria	29	15	4	12	Dysentery	12	11	6	10	Typhoid fev. (ent.)	9	7	8	13
22	Cholera infantum.	4	4	4	1	Membran. croup	14	8	6	3	Cholera morbus	11	8	6	8
23	Cholera morbus	9	8	3	4	Typhoid fev. (ent.)	11	8	5	9	Inflam. of brain	12	10	4	6
24	Puerperal fever	12	10	3	4	Whooping-cough	20	13	4	6	Whooping-cough	21	14	4	10
25	Cerebro-spi. men.	6	5	3	4	Cholera infantum.	4	3	3	2	Smallpox	1	1	3	1
26	Typho-mal. fever	19	7	3	4	Cholera morbus	9	7	1	6	Cholera infantum.	4	3	2	3
27	Membran. croup	17	9	2	4	Typho-mal. fever	15	5	1	2	Membran. croup	12	7	2	3
28	Smallpox	1	0.5	0	0	Smallpox	1	0.7	0	0	Typho-mal. fever	14	5	0	3
	Observers§	89	96	111	92	Observers§	91	99	104	103	Observers§	88	96	114	100

Line number.	April.					May.					June.				
	Diseases.	Av.'77-98.†	Av.'89-98.	1899.	1898.	Diseases.	Av.'77-98.†	Av.'89-98.	1899.	1898.	Diseases.	Av.'77-98.†	Av.'89-98.	1899.	1898.
	Average	37	32	26	26	Average	36	31	26	24	Average	35	30	23	24
1	Rheumatism	86	84	77	76	Neuralgia	80	77	76	64	Rheumatism	82	80	74	76
2	Neuralgia	84	82	73	76	Rheumatism	85	83	76	76	Neuralgia	77	74	68	65
3	Influenza	69	76	72	72	Bronchitis	75	72	69	67	Diarrhea	63	60	59	52
4	Tonsillitis	74	74	70	64	Tonsillitis	70	70	65	57	Tonsillitis	62	61	55	56
5	Bronchitis	81	80	70	68	Influenza	57	61	50	64	Bronchitis	67	65	55	56
6	Diarrhea	48	46	46	34	Diarrhea	53	50	46	37	Consumption, pul.	58	44	32	28
7	Pneumonia	66	55	42	47	Intermittent fev.	65	42	36	30	Influenza	40	41	32	50
8	Pleuritis	40	39	32	38	Pleuritis	33	34	35	30	Inflam. of kidney.	35	33	30	29
9	Inflam. of kidney	37	36	31	28	Inflam. of kidney.	37	36	35	22	Intermittent fev.	66	43	29	30
10	Intermittent fev.	61	39	30	24	Pneumonia	55	44	31	39	Inflam. of bowels.	29	28	23	23
11	Consumption, pul.	62	48	30	25	Consumption, pul.	62	47	28	30	Cholera morbus	33	27	23	18
12	Measles	30	24	21	27	Measles	33	26	25	18	Pleuritis	28	27	21	27
13	Erysipelas	42	36	20	25	Erysipelas	43	37	22	27	Remittent fever	46	30	21	21
14	Remittent fever	43	27	20	15	Remittent fever	45	29	21	19	Erysipelas	39	34	19	26
15	Inflam. of bowels	24	22	19	18	Inflam. of bowels.	27	26	17	23	Measles	28	24	19	24
16	Scarlet fever	27	19	15	9	Cholera morbus	17	14	16	11	Dysentery	23	20	16	15
17	Cerebro-spi. men.	9	5	14	5	Cerebro-spi. men.	8	6	13	6	Cholera infantum.	20	17	13	17
18	Inflam. of brain	12	9	11	7	Scarlet fever	24	19	13	8	Pneumonia	36	26	13	22
19	Cholera morbus	12	9	7	5	Dysentery	16	15	12	7	Typhoid fev. (ent.)	9	9	10	6
20	Dysentery	14	12	6	8	Puerperal fever	11	10	9	7	Cerebro-spi. men.	7	5	8	9
21	Puerperal fever	11	10	5	11	Typhoid fev. (ent.)	8	7	9	5	Scarlet fever	21	16	8	6
22	Typhoid fev. (ent.)	8	6	5	10	Diphtheria	20	11	6	2	Diphtheria	18	10	5	6
23	Diphtheria	21	10	4	6	Inflam. of brain	11	10	6	5	Inflam. of brain	11	10	5	6
24	Whooping-cough	21	16	4	8	Whooping-cough	23	16	4	11	Puerperal fever	11	9	4	6
25	Smallpox	2	0.8	3	1	Cholera infantum.	8	8	3	2	Typho-mal. fever	14	5	4	2
26	Cholera infantum.	4	3	3	5	Membran. croup	8	5	2	2	Whooping-cough	22	16	4	6
27	Membran. croup	11	7	0.9	4	Typho-mal. fever	14	6	0	3	Smallpox	1	0.5	0.8	0
28	Typho-mal. fever	14	6	0	2	Smallpox	2	0.3	0	0	Membran. croup	6	3	0	0.8
	Observers§	83	89	111	104	Observers§	91	101	127	132	Observers§	95	105	130	124

*, †, ‡. These notes are on the preceding page. §The numbers in this line state how many

reported present by months in each of the years 1898-99, and the average by months the period of 10 years, 1889-98.*

Per cent of observers by whom the diseases were reported present.‡

July.					August.					September.					
Diseases.	Av. '77-98.†	Av. '89-98.	1899.	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.	1898.	Line number.
Average	37	32	24	24	Average	39	34	27	30	Average	40	34	28	28	
Rheumatism	78	79	73	69	Diarrhea	93	89	85	84	Diarrhea	91	87	83	82	1
Neuralgia	76	73	66	53	Rheumatism	75	76	72	77	Rheumatism	77	78	73	71	2
Diarrhea	85	79	66	66	Neuralgia	74	73	67	65	Neuralgia	74	73	67	64	3
Bronchitis	59	59	53	52	Dysentery	68	61	61	54	Dysentery	65	60	64	50	4
Tonsillitis	56	60	52	46	Tonsillitis	56	59	53	52	Bronchitis	63	65	60	59	5
Dysentery	46	38	37	32	Cholera morbus	72	66	53	63	Tonsillitis	58	57	58	48	6
Cholera morbus	63	53	35	42	Cholera infantum.	62	55	51	49	Cholera morbus	61	57	47	56	7
Intermittent fev.	68	48	33	30	Bronchitis	57	58	50	57	Cholera infantum.	55	52	41	44	8
Consumption, pul.	57	44	30	31	Inflam. of bowels	37	37	35	38	Inflam. of kidney.	27	28	31	24	9
Inflam. of bowels	33	20	28	23	Intermittent fev.	69	50	33	45	Inflam. of bowels.	31	31	30	26	10
Inflam. of kidney	33	33	28	26	Remittent fever	55	39	28	33	Remittent fever	57	40	30	32	11
Cholera infantum	45	40	25	31	Inflam. of kidney	29	29	27	32	Intermittent fev.	69	50	30	45	12
Remittent fever	51	38	23	25	Consumption, pul.	55	43	26	29	Influenza	41	40	29	39	13
Pleuritis	24	24	20	22	Influenza	32	32	22	34	Consumption. pul.	54	42	27	21	14
Influenza	31	32	18	34	Typhoid fev. (ent.)	23	23	21	20	Typhoid fev. (ent.)	30	29	21	21	15
Erysipelas	36	30	17	20	Pleuritis	19	19	19	20	Pleuritis	23	24	20	19	16
Measles	20	17	17	15	Erysipelas	32	27	18	21	Pneumonia	26	20	19	20	17
Typhoid fev. (ent.).	14	14	12	11	Scarlet fever	16	13	8	10	Scarlet fever	17	13	13	7	18
Scarlet fever	18	13	10	10	Pneumonia	21	16	6	10	Erysipelas	30	27	9	18	19
Pneumonia	25	30	7	11	Typho-mal. fever	29	16	6	6	Whooping-cough	22	16	9	6	20
Whooping-cough	25	19	7	6	Whooping-cough	25	18	6	10	Diphtheria	21	11	5	3	21
Cerebro-spi. men.	7	5	5	6	Measles	10	8	6	10	Measles	6	4	5	4	22
Typho-mal. fever	19	10	5	4	Puerperal fever	9	6	5	9	Typho-mal. fever	38	18	4	12	23
Puerperal fever	9	7	5	4	Inflam. of brain	12	9	4	4	Cerebro-spi. men.	7	6	4	6	24
Inflam. of brain	12	10	3	7	Diphtheria	18	9	3	0.9	Puerperal fever	9	6	3	3	25
Membran. croup	4	3	0.9	0.7	Cerebro-spi. men.	7	6	0.9	9	Membran. croup	6	3	2	0	26
Diphtheria	18	9	0	2	Membran. croup	4	2	0	0	Inflam. of brain	10	8	0.9	4	27
Smallpox	1	0.2	0	0	Smallpox	0.6	0.2	0	0	Smallpox	0.5	0.1	0	0	28
Observers§	98	108	115	134	Observers§	100	109	109	115	Observers§	99	110	107	126	

October.					November.					December.					
Diseases.	Av. '77-98.†	Av. '89-98.	1899.	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.	1898.	Diseases.	Av. '77-98.†	Av. '89-98.	1899.	1898.	Line number.
Average	39	33	23	28	Average	36	31	25	28	Average	36	31	25	25	
Rheumatism	82	81	69	74	Rheumatism	82	81	74	75	Rheumatism	84	82	78	73	1
Neuralgia	79	77	65	74	Neuralgia	80	78	70	74	Neuralgia	81	78	72	73	2
Diarrhea	76	76	59	68	Tonsillitis	74	72	67	70	Tonsillitis	78	76	71	65	3
Tonsillitis	69	69	58	64	Bronchitis	76	74	66	76	Bronchitis	80	77	70	74	4
Bronchitis	75	70	58	68	Diarrhea	54	51	53	55	Influenza	67	77	60	76	5
Typhoid fev. (ent.).	33	32	33	25	Influenza	57	61	52	66	Diarrhea	46	46	48	42	6
Influenza	47	49	33	47	Pleuritis	31	31	38	32	Pleuritis	36	36	36	28	7
Dysentery	44	43	31	40	Inflam. of kidney	32	31	33	30	Consumption, pul.	56	41	36	22	8
Intermittent fev.	67	47	28	43	Consumption, pul.	56	40	31	28	Pneumonia	58	49	29	37	9
Remittent fever	56	41	25	28	Typhoid fev. (ent.)	27	25	29	25	Inflam. of kidney.	34	33	29	32	10
Consumption, pul.	56	40	24	23	Intermittent fev.	61	41	27	41	Erysipelas	39	34	25	28	11
Inflam. of kidney	33	32	23	32	Pneumonia	48	41	24	40	Intermittent fev.	55	34	22	22	12
Pleuritis	27	27	22	24	Erysipelas	36	31	22	31	Remittent fever	44	30	19	19	13
Inflam. of bowels	28	28	19	23	Inflam. of bowels.	24	22	20	20	Inflam. of bowels.	26	25	17	24	14
Cholera morbus	31	31	19	34	Remittent fever	49	35	20	25	Typhoid fev. (ent.)	19	16	16	11	15
Cholera infantum	25	26	17	26	Dysentery	41	20	17	13	Scarlet fever	26	21	14	12	16
Pneumonia	35	30	15	22	Scarlet fever	22	18	13	13	Measles	11	8	11	4	17
Erysipelas	35	28	13	24	Cholera morbus	14	13	11	14	Whooping-cough	19	12	10	8	18
Scarlet fever	21	16	10	10	Measles	8	6	9	0	Dysentery	14	13	9	8	19
Diphtheria	28	15	6	8	Whooping-cough	20	13	8	12	Diphtheria	29	16	9	10	20
Puerperal fever	10	8	5	4	Cholera infantum.	8	7	7	3	Cholera morbus	11	9	4	4	21
Whooping-cough	19	11	5	5	Diphtheria	29	15	7	9	Inflam. of brain	10	9	4	4	22
Cerebro-spi. men.	6	4	4	3	Puerperal fever	10	8	5	5	Membran. croup	15	9	4	0	23
Measles	6	4	4	2	Membran. croup	13	7	5	2	Cerebro-spi. men.	6	4	4	4	24
Typho-mal. fever	39	19	4	8	Cerebro-spi. men.	5	3	2	2	Typho-mal. fever	22	8	3	6	25
Membran. croup	10	6	2	2	Inflam. of brain	10	8	2	8	Cholera infantum.	5	4	2	0.9	26
Inflam. of brain	9	8	0.9	0.8	Typho-mal. fever.	29	11	3	8	Puerperal fever	9	8	1	0.9	27
Smallpox	0.5	0.3	0.9	0	Smallpox	0.8	0.2	1	0	Smallpox	1	0.1	0	0	28
Observers§	98	108	113	121	Observers§	96	106	102	106	Observers§	94	102	102	113	

observers reported for the month in the given year.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1899.—*Exhibiting for the year and for each month of the year ending December 30, 1899, a summary relative to diseases in the State of Michigan; also for each month a summary relative to diseases in each of 11 geographical divisions* of the State.—Indicating the prevalence as regards time and area. Compiled from 5,126 weekly reports by 214 health officers of cities and villages, and voluntary correspondents of the State Board of Health, reporting the diseases under their observation.*

Number of observers, reports, etc.†	Diseases.	Average per cent of observers reporting presence of.b	Average per cent of weeks reported present where present.c	Per cent of reports stating presence of.d	Average order of prevalence where present.e	Average order of prevalence where present.											
						1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	Av. 1877–1898.‡	Av. 1889–1898.
ending December 30, 1899. localities represented, 188. localities represented per month, 105. observers during the year, 214. observers per month, 111. reports compiled, 5,126. a reports per month, 427.	Average for tabulated diseases reported present.	26	66	17	2.8	2.6	2.7	2.7	3.0	3.0	3.3	3.1	3.3	3.3	3.3	3.7	3.0
	Brain, inflammation of	5	32	2	3.7	3.6	3.4	4.1	4.0	4.8	4.3	3.9	4.9	5.4	4.8	5.5	4.3
	Bowels, inflammation of	21	46	10	3.6	3.3	3.3	3.5	3.6	3.8	4.0	4.1	4.3	4.4	4.1	4.8	3.8
	Bronchitis	64	76	50	2.5	2.5	2.6	2.4	2.6	2.6	2.5	2.6	2.7	2.6	2.7	2.9	2.6
	Cerebro-spinal meningitis	7	42	3	3.3	3.2	3.4	3.6	3.7	3.9	4.4	3.7	5.3	4.7	4.2	5.6	4.0
	Cholera infantum	14	55	8	3.1	2.8	2.9	2.9	3.0	3.3	3.4	3.6	3.6	3.5	3.4	4.1	3.2
	Cholera morbus	19	52	10	2.9	2.7	3.0	2.9	3.0	3.3	3.3	3.4	3.4	3.5	3.4	4.1	3.2
	Consumption, pulmonary	28	78	22	2.9	2.9	3.1	3.0	3.5	3.4	3.5	3.7	3.8	3.5	3.5	4.1	3.4
	Croup, membranous	2	31	0.6	3.7	3.6	2.9	3.9	4.6	4.5	4.1	4.7	4.4	4.6	4.3	5.6	4.2
	Diphtheria	5	48	3	3.4	3.1	2.9	3.7	4.4	3.5	3.4	3.5	4.4	4.2	4.3	4.5	3.7
	Diarrhea	55	65	37	2.5	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.9	2.8	3.2	2.6
	Dysentery	23	54	13	3.0	3.0	3.2	3.0	3.2	3.3	3.6	3.8	3.8	3.8	3.7	4.3	3.4
	Erysipelas	20	47	10	3.7	3.3	3.4	3.5	3.7	3.8	3.9	4.1	4.2	4.1	4.1	4.7	3.8
	Fever, intermittent	28	59	17	2.9	2.6	2.7	2.7	2.9	2.9	2.9	3.0	3.2	2.9	2.6	2.6	2.8
	Fever, remittent	21	53	12	3.3	2.9	3.2	2.9	3.1	3.1	2.9	2.9	3.3	3.2	3.2	3.2	3.1
	Fever, typhoid (enteric)	14	59	9	2.9	2.9	3.3	3.3	3.4	3.6	3.2	3.6	3.5	3.8	3.9	4.6	3.5
	Fever, typho-malarial	3	43	1	2.6	3.1	2.7	2.8	3.2	3.7	3.6	3.7	3.6	3.6	3.9	4.1	3.4

For the year	Whole number of Average number of Whole number of Average number of Total number of Average number of	Influenza	53	77	42	1.7	1.7	1.8	1.8	2.0	2.2	2.0	2.1	2.0	2.2	2.4	2.6	2.0
		Kidney, inflammation of.......	30	63	19	3.4	3.2	3.4	3.5	3.6	3.7	3.7	3.6	3.9	4.1	4.1	4.0	3.7
		Measles........................	12	52	6	2.3	2.7	2.3	2.7	3.1	2.8	2.8	3.3	3.0	3.0	3.5	3.9	2.9
		Neuralgia......................	69	78	56	2.4	2.3	2.4	2.3	2.5	2.5	2.5	2.5	2.8	2.7	2.6	3.0	2.5
		Pleuritis.................. ...	30	50	16	3.6	3.3	3.6	3.4	3.8	3.8	3.8	4.0	4 1	4.2	4.0	3.9	3.8
		Pneumonia	31	55	17	3.5	3.2	3.4	3.2	3.7	3.7	3.6	3.7	4.0	3.9	3.7	4.1	3.6
		Puerperal fever................	5	36	2	3.5	3.1	3.1	3.2	3.5	3.9	3.8	4.1	4.5	4.5	3.4	5.3	3.7
		Rheumatism.....................	74	84	63	2.3	2.2	2.3	2.3	2.7	2.6	2.6	2.7	2.9	2.9	2.8	3.3	2.6
		Scarlet fever..................	14	56	8	3.1	2.7	3.0	3.1	3.5	3.3	3.6	3.2	4.2	4.2	3.9	4.5	3.5
		Smallpox	0.7	77	0.4	4.7	2.0	2.0	6.3	2.8	4.1	4.8	5.0	0	6.5	11.0	9.4	4.5
		Tonsillitis....................	63	66	42	2.7	2.7	2.6	2.6	3.0	3.0	2.8	2.9	3.3	3.4	3.3	3.4	3.0
		Whooping-cough	6	65	4	2.3	2.4	2.1	2.4	2.6	2.9	3.0	3.0	2.9	3.2	3.3	3.8	2.8

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* The counties in each division are shown in Exhibit I, in preceding reports.

† The names of observers, and number of reports received from each, are shown in Exhibit II.

‡ This note on page 77.

a Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

b The numbers in this column (pages 74-77) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 76 and 77 the numbers in the "per cent of observers" column are statements for the month, and not averages. This column indicates the area of prevalence except that in a few instances there were two or more observers in one city or village.

c This column states for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the diseases present. It is therefore an average, not for all localities represented, but only for those at which the given disease was reported present. In the line "average for tabulated diseases" it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or Division, as the case may be. It combines, and states, in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

e The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the order of prevalence column, in Table 3 (a table giving statements for each locality, omitted in printing this report, for want of room), by the number of observers who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of observers who reported the different diseases present, thus counting each observer once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.

TABLE 2.—CONTINUED.—*Diseases in the State, 1899. (Foot-notes and full tabular heads are on the two preceding pages.)*

Months.†	Diseases.	Per cent of observers reporting presence of. b	Average per cent of weeks reported present where present. a, c	Per cent of reports stating presence of. d	Average order of prevalence where present. e	Months.†	Per cent of observers reporting presence of. b	Average per cent of weeks reported present where present. a, c	Per cent of reports stating presence of. d	Average order of prevalence where present. e	Months.†	Per cent of observers reporting presence of. b	Average per cent of weeks reported present where present. a, c	Per cent of reports stating presence of. d	Average order of prevalence where present. e	Months.†	Per cent of observers reporting presence of. b	Average per cent of weeks reported present where present. a, c	Per cent of reports stating presence of. d	Average order of prevalence where present. e	Months.†	Per cent of observers reporting presence of. b	Average per cent of weeks reported present where present. a, c	Per cent of reports stating presence of. d	Average order of prevalence where present. e	Months.†	Per cent of observers reporting presence of. b	Average per cent of weeks reported present where present. a, c	Per cent of reports stating presence of. d	Average order of prevalence where present. e
January.†	Av. for tab. dis. rep. pres.....	25	72	18	3.1	February.†	26	72	19	3.2	March.†	28	64	18	2.9	April.†	26	69	18	2.7	May.†	26	59	16	2.5	June.†	23	62	15	2.3
	Brain, inflammation of	7	42	3	4.4		8	31	3	4.3		4	32	1	5.2		11	41	5	3.0		6	21	1	2.4		5	26	1	2.0
	Bowels, inflammation of......	17	49	9	4.3		15	50	8	4.6		18	45	8	5.1		19	62	11	3.6		17	39	7	2.6		23	41	10	2.9
	Bronchitis.....................	76	82	63	2.5		73	83	62	2.6		75	80	59	2.4		70	83	60	2.3		69	75	53	2.3		55	66	37	2.3
	Cerebro-spinal meningitis....	3	36	1	3.3		7	38	2	4.4		18	35	6	3.8		14	48	7	3.1		13	43	6	3.1		8	50	4	2.0
	Cholera infantum............	4	33	1	4.8		3	44	1	4.3		2	25	0.4	3.5		3	78	2	1.7		3	25	0.7	2.8		13	52	6	2.6
	Cholera morbus...............	3	36	1	5.0		1	50	0.5	4.0		6	21	1	3.4		7	37	3	3.9		16	28	4	3.1		23	47	10	2.6
	Consumption, pulmonary.....	23	88	20	3.7		21	90	19	3.7		25	72	19	3.5		30	69	21	3.0		28	76	20	2.8		32	74	24	2.2
	Croup, membranous	2	29	0.5	4.5		6	29	2	4.0		2	30	0.6	3.0		0.9	25	0.3	3.0		2	33	0.6	4.0		0	0	0	0
	Diphtheria	4	73	3	4.8		8	59	4	3.9		10	34	4	3.7		4	46	2	5.3		6	42	3	3.5		5	43	2	2.3
	Diarrhea........................	35	54	19	3.8		32	53	17	3.9		46	47	22	3.3		46	57	27	3.1		46	49	23	2.8		59	62	37	2.3
	Dysentery	9	34	3	4.2		6	39	2	4.7		10	33	3	3.4		6	44	3	2.4		12	31	4	3.2		16	45	8	3.2
	Erysipelas......................	23	56	12	4.5		27	47	13	4.5		28	42	12	3.9		20	47	9	3.5		22	40	9	2.9		19	49	9	2.9
	Fever, intermittent...........	21	60	13	3.9		20	55	12	4.2		24	42	11	3.3		30	63	19	3.2		36	51	19	2.5		29	60	19	2.5
	Fever, remittent..............	14	46	7	3.9		17	54	10	4.5		17	49	8	4.0		20	57	11	3.4		21	47	11	3.0		21	51	11	2.7
	Fever, typhoid (enteric)......	5	56	3	4.6		5	53	2	3.8		8	46	3	3.9		5	67	3	2.6		9	49	4	2.4		10	63	7	2.5
	Fever, typho-malarial.........	3	25	0.8	2.7		1	50	0.5	3.0		0	0	0	0		0	0	0	0		0	0	0	0		4	35	1	2.0
	Influenza	94	93	88	1.1		96	94	91	1.1		89	87	77	1.4		72	77	57	1.9		50	65	33	2.0		32	61	20	2.1
	Kidney, inflammation of......	32	63	20	4.1		26	63	16	4.1		38	57	22	3.5		31	78	24	3.4		35	61	21	2.7		30	62	19	2.7
	Measles	5	41	2	2.2		7	50	3	4.0		15	46	7	2.9		21	53	11	1.9		25	57	14	2.1		19	53	10	2.0
	Neuralgia......................	68	83	58	2.9		71	80	58	2.9		68	82	57	2.5		73	81	60	2.1		76	73	57	2.1		68	76	53	2.0
	Pleuritis	37	50	19	4.0		35	69	24	4.1		41	56	24	3.8		32	56	19	3.9		35	43	16	3.1		21	54	11	3.0
	Pneumonia	59	62	37	3.7		64	73	46	3.3		63	54	35	3.3		42	59	26	3.6		31	48	15	3.1		13	48	6	2.6
	Puerperal fever...............	3	30	0.8	4.0		6	39	2	5.7		10	32	3	3.4		5	45	2	3.3		9	29	3	2.9		4	47	2	2.6
	Rheumatism	72	86	63	2.8		72	80	59	3.1		81	85	68	2.5		77	86	67	2.2		76	83	63	1.9		74	84	63	1.8
	Scarlet fever..................	21	58	12	2.8		22	60	14	3.4		19	54	11	3.5		15	73	11	3.0		13	54	7	2.5		8	61	5	1.8
	Smallpox	0	0	0	0		0	0	0	0		3	100	2	4.3		3	77	2	4.0		0	0	0	0		0.8	50	0.2	2.0
	Tonsillitis......................	69	77	53	3.1		69	72	49	3.4		72	68	49	2.7		70	71	50	2.5		65	61	41	2.3		55	59	33	2.3
	Whooping-cough..............	5	63	4	3.2		4	64	2	2.8		4	53	2	2.8		4	31	1	2.8		4	47	2	3.2		4	76	3	1.2

	July.†				August.†				September.†				October.†				November.†				December.†			
Av. for tab. dis. rep. pres.	24	67	17	2.6	27	62	17	2.7	28	66	19	2.8	23	66	17	2.7	25	64	17	2.8	25	68	17	2.9
Brain, inflammation of	3	33	1	4.3	4	22	0.8	3.5	0.9	50	0.5	5.0	0.9	25	0.3	9.0	2	22	0.4	5.0	4	38	1	4.8
Bowels, inflammation of	28	47	13	3.3	35	47	16	2.9	30	47	14	3.4	19	43	9	3.4	20	39	8	4.2	17	48	8	4.1
Bronchitis	53	71	38	2.8	50	64	32	3.1	60	71	43	2.9	58	75	48	2.6	66	76	52	2.3	70	85	59	2.2
Cerebro-spinal meningitis	5	46	3	3.8	0.9	20	0.2	6.0	4	43	2	3.3	4	42	2	2.8	2	60	1	5.5	4	25	1	3.5
Cholera infantum	25	65	17	2.7	51	58	31	2.9	41	57	24	3.3	17	47	8	3.5	7	45	3	3.7	2	25	0.6	4.5
Cholera morbus	35	67	25	2.5	53	59	32	2.6	47	58	28	2.7	19	54	11	3.4	11	39	4	4.6	4	38	2	5.0
Consumption, pulmonary	30	83	25	2.9	26	74	19	2.6	27	78	21	3.4	24	81	22	3.0	31	83	26	2.5	36	71	26	2.9
Croup, membranous	0.9	25	0.2	5.0	0	0	0	0	2	25	0.5	3.0	2	38	0.8	1.5	5	35	2	4.0	4	29	1	3.8
Diphtheria	0	0	0	0	3	20	0.6	3.3	5	56	3	2.8	6	76	5	1.8	7	50	3	3.0	9	47	4	4.0
Diarrhea	66	79	53	1.9	85	81	68	1.7	83	87	72	1.8	59	73	47	2.2	53	57	31	2.8	48	53	26	3.0
Dysentery	37	61	23	3.1	61	63	39	2.6	64	67	43	2.8	31	52	18	2.9	17	37	6	3.7	9	43	4	4.1
Erpsipelas	17	48	8	3.6	18	47	9	3.5	9	50	5	3.9	13	42	6	3.9	22	51	11	3.4	25	49	12	4.3
Fever, intermittent	33	67	23	2.4	33	62	21	2.4	30	62	18	2.9	28	71	21	2.6	27	61	17	2.8	22	51	11	3.2
Fever, remittent	23	55	13	3.1	28	50	14	3.2	30	57	17	3.1	25	60	16	3.3	20	58	12	3.4	19	53	10	3.5
Fever, typhoid (enteric)	12	57	7	3.2	21	62	12	2.4	21	68	14	3.1	33	59	21	2.8	29	59	18	2.9	16	65	10	2.9
Fever, typho-malarial	5	50	3	2.3	6	34	2	3.0	4	40	2	3.5	4	67	3	1.8	3	55	1	3.0	3	42	1	3.0
Influenza	18	71	14	2.4	22	62	15	2.3	29	58	17	2.0	33	64	24	2.5	52	64	35	2.2	60	77	47	2.1
Kidney, inflammation of	28	67	19	3.1	27	57	16	3.4	31	59	18	3.6	23	69	17	3.4	33	65	23	3.5	29	58	18	3.4
Measles	17	56	9	2.2	6	66	4	2.0	5	56	3	2.8	4	50	2	2.8	9	37	3	2.8	11	50	6	2.3
Neuralgia	66	77	50	2.3	67	69	47	2.7	67	78	54	2.7	65	77	56	2.3	70	80	58	2.2	72	86	61	2.3
Pleuritis	20	55	11	3.3	19	38	7	3.6	20	43	9	3.5	22	42	10	3.4	38	45	18	3.2	36	52	19	3.6
Pneumonia	7	43	3	2.9	6	34	2	4.0	19	33	6	4.3	15	41	7	3.5	24	50	12	3.4	29	52	15	4.1
Puerperal fever	5	45	2	1.5	5	26	1	3.4	3	40	1	3.3	5	48	3	4.5	5	38	2	4.2	1	25	0.3	5.0
Rheumatism	73	86	64	2.0	72	80	57	2.5	73	86	63	2.6	69	85	65	2.0	74	80	60	2.0	78	86	68	2.3
Scarlet fever	10	51	5	3.0	8	49	4	3.2	13	43	6	3.0	10	61	6	2.9	13	66	8	3.3	14	45	6	4.0
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0.9	100	0.5	7.0	1	20	0.2	8.0	0	0	0	0
Tonsillitis	52	56	30	2.7	53	50	27	2.9	58	58	34	3.0	58	62	40	2.9	67	72	49	2.5	71	80	56	2.6
Whooping-cough	7	64	4	1.8	6	78	4	2.1	9	58	5	2.5	5	86	5	1.3	8	67	5	2.4	10	74	8	2.4

[Foot-notes from pages 63, 71 and 75.]

†Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsillitis were not printed on any blanks prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the cards used prior to October, 1883, and not on all used for several months after that date; pleuritis was not printed on any cards used prior to 1888; hence it is probable that the diseases were not so fully reported at first as were the other diseases.

‡The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve monthsof the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The columns for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

TABLE 2.—CONTINUED.—*Diseases in the Upper Peninsula, the Northwestern, the Northern, and the Northeastern Divisions of the State for the year and by months in 1899; also an average for the period of 22 years, 1877-1898, and an average for the period of 10 years, 1889-1898—indicating what per cent of the weekly reports received stated the presence of the diseases named.*d

Division.*	Diseases.	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres.	26	22	18	26	25	22	19	16	11	14	16	15	19	20	22
Upper Peninsular Division.*	Brain, inflammation of	6	4	1	7	0	0	0	0	0	0	0	11	0	0	0
	Bowels, inflammation of	16	12	7	0	0	11	0	0	7	12	12	17	6	9	13
	Bronchitis	69	62	58	80	100	89	57	67	30	47	29	61	50	50	67
	Cerebro-spi. meningitis	3	2	12	0	0	0	7	25	26	12	0	0	25	23	7
	Cholera infantum	14	16	14	7	0	0	0	0	0	41	71	39	6	5	0
	Cholera morbus	19	17	6	7	0	0	0	0	0	6	29	33	0	0	0
	Consumption, pulmonary	56	37	28	47	20	21	29	0	30	18	18	44	50	36	33
	Croup, membranous	5	3	5	0	10	11	7	8	0	6	0	6	0	9	7
	Diphtheria	10	11	3	0	0	0	0	0	7	0	0	6	13	9	0
	Diarrhea	58	53	47	40	20	42	43	38	33	59	88	57	63	27	53
	Dysentery	22	19	5	7	0	0	0	4	7	0	29	6	0	5	0
	Erysipelas	19	14	7	27	0	0	0	8	4	0	0	6	6	18	0
	Fever, intermittent	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fever, remittent	8	2	0.5	0	0	0	0	0	0	0	0	0	0	0	7
	Fever, typhoid (enteric)	28	26	20	20	0	11	21	25	19	24	18	6	44	23	27
	Fever, typho-malarial	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Influenza	42	42	43	100	100	84	57	54	19	0	0	6	19	50	60
	Kidney, inflammation of	27	19	22	67	30	47	50	17	4	0	18	6	19	32	0
	Measles	13	7	9	20	20	0	0	8	7	12	0	0	19	9	27
	Neuralgia	56	55	44	67	80	63	64	42	22	35	24	11	31	65	67
	Pleuritis	18	18	11	7	40	16	7	13	7	12	6	0	0	18	20
	Pneumonia	33	27	30	60	60	42	36	21	7	35	18	17	38	27	40
	Puerperal fever	5	4	7	0	40	5	0	8	4	0	0	0	6	27	0
	Rheumatism	59	52	48	60	60	79	64	50	22	18	29	33	63	45	73
	Scarlet fever	22	18	6	20	20	0	0	13	4	0	0	0	0	14	0
	Smallpox	0.3	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	53	57	51	80	90	89	93	38	22	35	35	28	38	45	67
	Whooping-cough	20	17	19	7	0	16	0	8	15	24	18	22	50	32	33

Division.*	Diseases.	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres.	27	22	11	14	13	12	10	7	10	10	12	12	10	10	12
Northwestern Division.*	Brain, inflammation of	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bowels, inflammation of	12	17	0.9	0	0	0	0	0	0	6	4	0	0	0	0
	Bronchitis	60	62	27	44	23	24	23	19	22	28	29	30	13	33	35
	Cerebro-spi. meningitis	2	2	7	0	8	41	31	10	11	0	0	0	0	0	0
	Cholera infantum	18	14	5	0	0	0	0	0	6	0	29	15	0	0	0
	Cholera morbus	18	16	4	0	0	0	0	0	17	0	4	5	0	13	0
	Consumption, pulmonary	40	37	22	13	0	18	0	5	11	17	33	35	27	42	47
	Croup, membranous	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diphtheria	11	7	2	19	15	0	0	0	0	0	0	0	0	0	0
	Diarrhea	50	44	27	13	15	18	15	10	28	33	63	55	27	17	18
	Dysentery	23	18	11	6	8	0	0	0	0	11	42	25	7	4	12
	Erysipelas	24	17	7	6	23	24	0	0	6	11	13	0	0	4	6
	Fever, intermittent	50	27	0.5	0	0	0	0	0	0	0	0	0	0	0	6
	Fever, remittent	31	20	7	0	0	0	0	5	11	17	0	0	20	8	24
	Fever, typhoid (enteric)	10	9	6	0	0	6	0	0	0	0	8	10	33	8	0
	Fever, typho-malarial	16	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Influenza	45	43	20	50	77	47	46	29	6	0	0	0	0	8	18
	Kidney, inflammation of	22	21	3	13	0	0	0	0	0	0	0	5	20	0	0
	Measles	12	9	13	0	23	29	38	43	17	6	0	5	7	0	6
	Neuralgia	64	57	40	56	46	47	38	33	44	39	33	35	33	38	47
	Pleuritis	20	21	8	6	0	6	15	5	11	6	4	5	13	21	6
	Pneumonia	37	32	11	31	15	41	8	5	6	6	0	0	7	13	1[illegible]
	Puerperal fever	5	5	3	0	0	0	0	0	11	0	4	0	20	0	0
	Rheumatism	63	56	45	63	46	41	46	33	44	44	42	50	33	46	59
	Scarlet fever	13	6	8	31	31	6	8	0	0	0	0	10	0	13	12
	Smallpox	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	52	47	23	38	31	0	15	14	33	33	21	30	7	21	29
	Whooping-cough	11	5	3	0	0	0	0	0	0	17	0	10	7	0	0

	Av. for tab. dis. rep. pres.	19	20	20	17	18	15	17	17	18	22	23	28	22	24	23		25	23	18	18	19	20	19	17	13	14	20	18	20	20	16
Northern Division.*	Brain, inflammation of..	9	13	2	3	0	0	3	3	0	0	0	0	0	4	17	Northeastern Division.*	3	2	3	13	19	6	0	0	0	0	0	0	0	0	0
	Bowels, inflammation of.	9	13	12	0	0	9	13	6	11	14	43	9	13	17	6		21	21	18	6	6	0	13	6	38	21	33	33	33	24	15
	Bronchitis	53	61	67	73	77	50	63	65	61	67	65	77	65	78	78		69	63	59	63	63	78	67	61	44	36	53	50	67	59	62
	Cerebro-spi. meningitis..	4	5	3	0	5	3	7	0	4	0	4	18	0	0	0		1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cholera infantum	7	7	10	0	0	0	0	0	0	24	61	45	4	0	0		7	5	1	0	0	0	0	0	6	0	7	0	0	0	0
	Cholera morbus	8	9	8	0	0	0	0	0	4	24	43	32	0	4	0		8	5	7	0	0	0	0	0	6	7	33	33	17	0	0
	Consumption, pulmonary	28	33	35	20	18	16	20	42	46	48	35	50	48	57	39		35	22	1	0	0	0	7	6	0	0	0	0	0	0	0
	Croup, membranous	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0		3	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diphtheria	6	6	2	7	5	0	0	0	7	0	0	0	0	0	0		9	9	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diarrhea	27	23	36	17	18	9	33	19	29	76	65	82	30	48	28		50	41	45	31	44	39	33	39	50	57	73	67	67	29	23
	Dysentery	15	12	20	0	5	0	0	0	11	48	91	73	22	17	0		13	6	3	6	0	0	0	11	0	0	7	17	0	0	0
	Erysipelas	23	29	17	3	18	19	17	23	25	19	22	18	13	4	33		28	30	27	25	25	17	27	22	0	29	47	50	33	29	31
	Fever, intermittent	22	20	6	0	9	0	3	0	4	29	0	9	13	9	6		26	25	13	19	0	17	13	11	0	14	13	0	25	29	15
	Fever, remittent	10	14	7	0	0	0	7	0	7	5	22	18	13	4	11		9	3	19	13	13	6	20	22	19	14	20	33	42	29	0
	Fever, typhoid (enteric)	8	7	5	0	0	0	0	16	14	0	0	18	4	0	0		2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fever, typho-malarial	6	2	3	0	0	0	0	0	0	0	0	0	17	17	0		5	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Influenza	36	44	52	93	100	81	47	42	36	38	22	18	30	35	72		52	62	46	75	69	61	40	28	25	29	33	33	42	53	54
	Kidney, inflammation of.	18	24	18	0	9	6	17	19	14	10	13	27	17	57	39		40	45	37	44	38	50	27	39	31	36	40	33	33	35	31
	Measles	8	7	9	0	0	6	30	26	25	10	0	0	0	0	0		9	7	2	0	0	0	13	6	0	0	0	0	0	0	8
	Neuralgia	51	53	59	63	50	38	47	45	50	52	48	77	91	78	89		67	59	48	56	50	56	47	50	25	36	47	50	58	59	38
	Pleuritis	21	21	22	23	32	19	7	16	18	14	0	27	43	39	44		26	28	34	19	25	33	67	50	31	29	33	17	25	41	31
	Pneumonia	19	19	17	30	36	13	17	16	0	5	4	9	9	43	17		25	20	19	25	44	39	27	28	0	0	0	0	0	29	23
	Puerperal fever	5	4	0.3	0	0	3	0	0	0	0	0	0	0	0	0		2	2	4	0	6	17	13	0	0	0	0	0	17	0	0
	Rheumatism	60	64	75	70	45	72	70	81	79	81	48	91	87	96	89		67	62	62	75	81	83	67	67	50	50	60	42	50	59	46
	Scarlet fever	5	5	17	23	27	22	30	19	14	14	13	14	13	0	6		7	8	2	0	0	0	0	6	0	0	0	0	0	18	0
	Smallpox	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0		.06	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	35	39	45	50	55	44	40	42	36	29	17	41	57	65	67		54	47	45	38	50	61	60	28	25	29	47	42	42	59	54
	Whooping-cough	8	6	4	0	0	0	0	0	0	14	13	18	13	0	0		6	5	4	0	0	0	0	0	0	0	0	0	0	18	31

*, †, d. These notes on page 75. ‡Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 19 years, 1880-98; for neuralgia and tonsillitis, an average for the 20 years, 1879-98; pleuritis was not compiled until 1888; for other diseases and for the average line an average for the 22 years, 1877-98. For the Northwestern Division, 1879-98. For the Northern Division, 1882-98. For the Northeastern Division, 1883-98.

TABLE 2.—CONTINUED.—*Diseases in the Western, Northern Central, Bay and Eastern, and the Central Divisions of the State, for the year and by months in 1899; also an average for the period of 22 years, 1877-1898, and an average for the period of 10 years, 1889-1898—indicating what per cent of the weekly reports received stated the presence of the diseases named.*d

Division*	Diseases.	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Division*	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres.	27	22	19	18	19	19	20	18	18	18	19	20	19	19	18		22	18	13	16	15	13	12	12	13	12	12	11	10	13	15
Western Division.*	Brain, inflammation of...	4	3	2	0	2	3	13	1	2	2	2	0	0	0	0	Northern Central Division.*	3	3	1	14	0	3	5	0	0	0	0	0	0	0	0
	Bowels, inflammation of.	15	14	11	19	8	6	15	16	12	7	10	18	9	12	3		5	5	4	0	13	3	0	3	6	11	6	0	0	4	5
	Bronchitis..............	51	46	51	50	55	55	45	66	43	43	41	38	58	55	63		47	44	42	50	47	43	55	52	34	26	19	43	45	50	60
	Cerebro-spi. meningitis..	3	3	5	0	4	11	13	9	6	2	0	2	2	2	0		4	0.9	5	0	0	20	14	14	3	0	0	0	0	0	0
	Cholera infantum	12	9	8	0	0	0	0	0	8	22	39	24	2	2	0		12	11	5	0	0	0	0	0	6	11	25	9	0	0	0
	Cholera morbus..........	16	12	8	0	0	2	0	8	12	20	20	22	14	4	0		13	10	7	0	13	3	0	0	3	11	28	9	5	0	0
	Consumption, pulmonary	40	31	23	15	23	23	15	20	20	26	25	20	28	31	40		33	32	23	21	27	17	36	28	34	44	0	9	25	21	15
	Croup, membranous......	5	3	1	2	2	2	0	1	0	0	0	0	0	6	3		4	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diphtheria..............	16	7	4	8	8	6	2	5	0	0	0	0	9	8	3		14	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diarrhea................	44	42	37	19	21	27	32	23	43	65	67	71	35	24	17		40	35	29	29	20	13	5	21	25	41	59	65	35	18	15
	Dysentery...............	20	15	12	2	2	2	4	3	10	22	30	40	26	10	0		15	15	9	0	0	7	0	0	3	15	31	35	0	0	0
	Erysipelas..............	24	17	15	19	17	19	15	9	24	4	18	2	9	18	29		21	14	7	29	13	7	5	7	16	4	0	0	0	7	10
	Fever, intermittent......	55	34	23	13	19	18	30	28	37	35	23	22	21	20	9		50	36	27	21	0	13	36	38	31	33	13	22	20	46	45
	Fever, remittent.........	48	33	24	23	21	27	28	19	20	15	33	31	23	31	17		38	25	4	7	27	10	5	0	0	0	3	0	0	4	0
	Fever, typhoid (enteric)..	9	7	6	0	0	0	0	3	0	0	7	24	30	16	0		10	11	6	0	0	0	5	0	6	7	6	17	5	18	0
	Fever, typho-malarial....	16	6	2	2	0	0	0	0	4	2	3	2	5	0	3		15	4	0.7	0	0	0	0	0	3	0	3	0	0	0	0
	Influenza................	46	48	48	94	94	84	68	32	22	17	20	24	30	41	43		20	29	21	50	73	50	23	0	3	4	3	0	10	32	45
	Kidney, inflammation of.	21	24	16	13	6	15	17	18	22	20	18	13	23	14	11		9	11	7	21	0	10	14	10	16	0	0	0	0	0	10
	Measles..................	6	7	12	0	0	6	21	27	25	17	16	2	0	8	14		11	7	7	14	20	7	0	28	6	11	0	0	0	0	0
	Neuralgia................	67	62	56	63	57	55	60	50	55	61	52	60	49	61	57		51	49	40	29	40	23	50	45	47	37	44	26	40	43	55
	Pleuritis................	18	19	12	10	19	21	13	16	10	11	7	9	2	14	9		7	8	7	14	27	13	14	3	0	0	0	0	5	7	20
	Pneumonia................	32	25	22	46	58	29	28	23	8	7	3	18	9	12	11		25	20	10	43	40	27	0	10	13	0	0	4	0	0	5
	Puerperal fever..........	5	4	2	0	4	0	0	4	0	2	3	4	2	0	0		5	6	1	7	0	3	0	0	0	0	0	4	0	0	0
	Rheumatism...............	63	64	62	56	57	61	62	62	73	72	61	60	72	51	63		56	54	48	43	40	43	36	34	56	52	59	35	45	50	70
	Scarlet fever............	16	9	11	10	21	8	19	14	10	11	0	9	9	14	3		8	9	4	0	0	3	0	0	0	11	16	4	0	0	5
	Smallpox.................	0.5	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0		0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis..............	45	44	47	52	49	55	47	49	41	26	34	47	56	47	74		46	37	35	50	27	33	45	31	28	22	13	22	50	54	65
	Whooping-cough...........	12	7	6	0	0	2	2	0	0	2	8	9	9	16	37		10	7	4	0	0	0	0	0	16	7	9	13	0	0	0

Bay and Eastern Division.*

Av. for tab. dis. rep. pres.	27	20	17	18	17	18	18	13	12	17	18	19	15	18	15
Brain, inflammation of	4	3	1	4	0	0	5	0	0	3	0	0	3	0	2
Bowels, inflammation of	17	14	13	9	10	7	16	4	13	16	24	26	3	15	20
Bronchitis	61	52	54	65	68	56	67	43	42	38	37	52	58	62	56
Cerebro-spi. meningitis	4	3	0.7	2	2	2	0	0	0	0	0	2	0	0	0
Cholera infantum	15	13	11	4	0	0	0	2	10	30	35	31	14	9	2
Cholera morbus	18	14	12	0	0	2	7	4	16	24	41	31	14	6	2
Consumption, pulmonary	54	41	9	11	0	8	9	7	0	0	10	19	11	15	16
Croup, membranous	6	3	0.2	0	2	0	0	0	0	0	0	0	0	0	0
Diphtheria	18	11	3	0	4	8	0	7	0	0	0	10	0	0	0
Diarrhea	44	37	39	22	16	24	35	28	35	65	65	74	50	49	27
Dysentery	16	12	15	4	10	5	0	0	13	38	41	43	17	13	7
Erysipelas	19	13	11	20	14	16	21	7	6	5	4	2	6	11	11
Fever, intermittent	49	20	11	5	8	10	9	11	23	24	16	7	6	11	4
Fever, remittent	30	15	8	5	12	3	5	9	16	16	14	5	8	2	7
Fever, typhoid (enteric)	11	14	4	7	2	5	0	0	0	0	10	0	6	9	0
Fever, typho-malarial	19	7	0.2	0	0	0	0	0	0	0	0	0	0	2	0
Influenza	41	41	48	85	84	71	65	28	16	11	24	29	33	45	49
Kidney, inflammation of	11	14	23	27	20	25	28	24	10	22	20	21	25	30	24
Measles	12	9	4	0	0	2	0	7	3	8	14	7	6	2	0
Neuralgia	62	55	52	49	62	59	47	48	48	54	45	52	56	51	49
Pleuritis	20	19	23	27	22	27	26	28	16	19	14	12	6	36	33
Pneumonia	31	22	15	18	34	41	26	9	0	0	0	5	3	11	11
Puerperal fever	4	3	0.9	0	2	5	0	0	0	0	2	0	0	0	0
Rheumatism	68	60	57	58	56	63	67	61	52	51	51	62	50	51	56
Scarlet fever	14	11	10	16	6	10	12	2	6	11	10	14	6	21	4
Smallpox	0.7	0.3	0.6	0	0	0	0	0	0	0	0	0	6	2	0
Tonsillitis	46	42	43	51	42	53	60	41	23	38	33	33	36	53	42
Whooping-cough	18	11	3	7	6	0	0	0	0	3	4	2	0	0	11

Central Division.*

Av. for tab. dis. rep. pres.	24	20	18	21	22	21	17	18	17	17	17	19	17	16	16
Brain, inflammation of	4	3	1	0	5	0.9	0	0.8	3	0	1	0	0	0	1
Bowels, inflammation of	13	13	9	11	13	12	9	7	12	8	11	8	8	0	7
Bronchitis	54	55	54	76	72	74	65	54	40	34	28	43	46	56	56
Cerebro-spi. meningitis	3	2	3	2	0	6	7	8	3	6	0	0	3	0	0
Cholera infantum	10	8	7	1	1	0	7	3	8	10	20	22	10	2	0
Cholera morbus	14	13	11	0	0	2	2	8	11	28	33	28	12	4	5
Consumption, pulmonary	48	36	34	38	39	32	29	33	37	39	32	32	23	38	36
Croup, membranous	3	2	0.3	0	3	0	0	0	0	0	0	0	0	0	1
Diphtheria	12	4	2	2	1	4	3	2	0	0	2	5	3	0	5
Diarrhea	42	42	39	22	23	27	24	26	43	55	73	77	55	26	20
Dysentery	14	13	15	4	1	4	0	5	8	27	43	54	23	5	7
Erysipelas	18	15	7	7	8	13	7	11	5	7	1	1	4	9	12
Fever, intermittent	51	28	20	21	19	14	24	25	19	19	23	18	21	15	10
Fever, remittent	36	24	13	8	13	8	10	17	13	19	11	20	18	8	9
Fever, typhoid (enteric)	11	11	11	0	3	5	0	0.8	11	11	17	20	27	23	16
Fever, typho-malarial	12	4	2	1	0	0	0	0	3	10	1	1	1	1	4
Influenza	40	44	47	96	96	85	53	36	18	16	21	27	37	38	43
Kidney, inflammation of	20	20	23	16	20	22	21	24	32	22	17	16	14	24	14
Measles	9	7	6	1	3	12	8	13	12	15	1	1	1	1	4
Neuralgia	64	64	60	69	67	64	63	68	63	49	49	54	58	60	60
Pleuritis	15	16	17	26	35	31	19	18	14	8	7	6	10	12	15
Pneumonia	26	20	18	38	56	34	24	17	12	2	5	8	6	3	11
Puerperal fever	4	2	3	2	0	5	3	4	4	7	0	0	5	2	1
Rheumatism	63	66	65	71	63	70	60	68	69	61	60	62	65	66	68
Scarlet fever	10	8	6	6	11	21	7	10	9	3	0	0	1	2	1
Smallpox	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	42	44	39	55	53	52	38	37	35	24	20	30	31	46	49
Whooping-cough	12	8	4	12	5	2	2	4	3	5	5	4	3	1	0

*, †, d. These notes on page 75. ‡Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 19 years, 1880-1898; for neuralgia and tonsillitis, an average for the 20 years, 1879-98; pleuritis was not compiled until 1888; for other diseases and for the average line, an average for the 22 years, 1877-98; for the Northern Central Division an average for the 19 years, 1880-1898.

TABLE 2.—CONTINUED.—*Diseases in the Southwestern and Southern Central Divisions of the State, for the year and by months in 1899; also an average for the period of 22 years, 1877-1898, and an average for the period of 10 years, 1889-1898—indicating what per cent of the weekly reports received stated the presence of the diseases named.*d

Division.*	Diseases.	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Division.*	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres.	25	22	19	18	15	18	22	18	17	20	22	26	20	19	28		26	22	17	17	19	20	21	14	12	16	17	18	18	16	17
Southwestern Division.*	Brain, inflammation of	3	3	0.5	0	0	0	4	0	0	0	4	0	0	0	0	Southern Central Division.*	3	3	1	4	2	3	5	1	1	1	1	0	0	0	0
	Bowels, inflammation of	12	13	11	6	17	5	8	2	8	15	15	22	15	10	19		13	11	11	11	7	12	11	6	5	20	24	17	10	7	4
	Bronchitis	53	54	47	52	43	44	48	50	39	45	22	43	56	57	88		59	53	44	55	58	59	71	47	27	31	26	34	42	43	55
	Cerebro-spi. meningitis	2	15	2	3	3	2	16	2	0	0	0	0	0	0	6		3	1	1	0	0	1	2	0	2	4	0	0	1	0	1
	Cholera infantum	17	15	10	0	7	2	0	0	8	21	37	30	19	7	0		10	8	10	2	2	0	0	0	8	19	27	31	13	6	0
	Cholera morbus	16	16	16	3	0	0	8	7	25	39	59	48	11	7	0		18	16	12	4	0	3	4	3	8	29	32	31	16	7	1
	Consumption, pulmonary	55	37	10	15	10	9	20	14	8	15	4	0	15	0	0		49	34	18	13	27	26	27	17	20	20	14	10	12	17	13
	Croup, membranous	4	3	0.5	3	0	0	0	0	0	0	0	0	4	0	0		3	1	0.2	0	0	0	0	0	0	0	0	1	0	1	0
	Diphtheria	8	3	5	0	7	0	0	5	3	0	0	0	15	13	31		10	5	2	0	0	6	4	1	2	0	1	0	0	6	4
	Diarrhea	38	36	31	3	0	12	16	18	42	42	81	87	41	27	38		44	42	36	15	7	17	22	19	27	40	67	69	64	38	36
	Dysentery	15	16	12	3	0	0	4	11	8	21	59	43	4	0	0		17	16	13	5	0	4	9	1	5	19	33	50	25	2	3
	Erysipelas	22	21	14	18	13	7	8	11	11	18	30	22	4	20	13		16	12	5	2	10	7	4	5	6	7	7	1	6	4	3
	Fever, intermittent	59	38	41	24	13	19	40	39	36	45	81	65	63	43	56		54	33	14	11	12	3	16	11	14	16	21	23	25	10	3
	Fever, remittent	39	29	19	3	7	12	20	16	14	21	15	35	30	33	44		40	24	11	4	3	6	9	6	8	13	15	19	18	16	7
	Fever, typhoid (enteric)	6	5	2	0	0	0	0	0	0	0	0	0	4	17	13		8	8	9	0	2	0	4	5	2	9	13	10	25	17	13
	Fever, typho-malarial	15	7	3	3	7	0	0	0	0	0	7	9	11	0	6		12	5	0.3	0	0	0	0	0	0	1	2	0	0	0	0
	Influenza	46	51	58	97	83	79	88	52	39	30	30	26	30	47	100		42	47	36	84	97	86	65	32	14	3	3	7	12	29	48
	Kidney, inflammation of	16	17	31	27	10	23	44	32	33	27	30	48	26	40	50		17	16	21	22	29	35	31	19	8	23	15	19	19	22	19
	Measles	10	8	8	0	0	5	24	20	14	9	0	17	0	0	0		10	8	1	2	0	6	2	3	2	1	0	0	0	0	0
	Neuralgia	67	61	66	58	53	72	72	73	67	58	48	83	17	63	94		69	67	63	58	63	68	75	63	59	53	55	63	64	67	70
	Pleuritis	17	17	13	18	10	19	12	7	8	12	11	17	7	10	25		16	15	13	20	25	26	25	14	2	9	4	6	12	12	12
	Pneumonia	28	24	20	45	50	47	32	16	3	0	0	4	0	7	38		30	23	16	36	42	45	40	9	4	0	1	3	7	7	19
	Puerperal fever	3	4	0.5	0	0	0	0	5	0	0	0	0	0	0	0		3	2	1	0	2	0	4	1	1	3	2	0	0	1	0
	Rheumatism	75	75	74	55	47	70	72	73	81	91	63	87	89	77	100		71	70	72	67	68	83	85	64	65	80	66	73	72	73	81
	Scarlet fever	11	9	7	18	13	9	12	7	0	6	11	0	0	0	13		13	10	5	5	10	6	5	1	0	1	2	7	9	6	15
	Smallpox	0.3	0	4	0	0	21	20	0	0	0	0	0	0	0	0		0.4	0.3	0.6	0	0	4	4	0	0	0	0	0	0	0	0
	Tonsillitis	44	45	38	48	23	42	48	39	25	33	11	39	52	43	63		51	52	49	60	61	57	62	53	43	36	32	36	40	56	69
	Whooping-cough	13	10	0.8	0	0	0	0	5	3	0	0	0	0	0	0		14	9	0.6	0	2	3	2	1	0	0	0	0	0	0	0

*, †, d. These notes on page 75. ‡Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 19 years, 1880-1898; for neuralgia and tonsillitis, an average for the 20 years, 1879-98; pleuritis was not compiled until 1888; for other diseases and for the average line, an average for the 22 years, 1877-98.

TABLE 2.—CONCLUDED.—*Diseases in the Southeastern Division of the State, for the year and by months in 1899; also an average for the period of 22 years 1877-1898, and an average for the period of 10 years, 1889-1898—indicating what per cent of the weekly reports received stated the presence of the diseases named.*d

Division.*	Diseases.	1877-98.‡	1889-98.	1899.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Av. for tab. dis. rep. pres	27	18	16	17	18	14	21	14	14	17	15	16	13	15	15
Southeastern Division.*	Brain, inflammation of	8	2	3	12	3	0	12	9	3	3	0	0	0	2	0
	Bowels, inflammation of	14	8	9	4	0	5	28	9	9	18	11	13	6	8	3
	Bronchitis	61	54	46	69	65	50	68	51	34	42	32	26	33	40	56
	Cerebro-spinal meningitis	5	1	2	0	6	2	0	7	0	0	0	0	0	0	3
	Cholera infantum	12	7	4	0	0	2	4	0	0	15	20	3	3	0	3
	Cholera morbus	18	11	10	0	0	0	4	2	11	39	36	26	6	0	0
	Consumption, pulmonary	60	39	19	15	6	5	12	18	29	24	14	13	21	31	33
	Croup, membranous	8	2	1	0	3	0	0	0	0	0	0	0	6	4	3
	Diphtheria	19	6	5	0	13	2	0	4	6	0	0	3	21	2	6
	Diarrhea	44	34	34	19	23	16	36	18	46	55	61	65	21	27	22
	Dysentery	19	10	14	0	0	7	12	7	14	24	30	35	18	13	6
	Erysipelas	24	14	5	4	13	7	0	4	0	6	2	0	3	15	3
	Fever, intermittent	46	23	14	8	10	7	12	18	11	18	18	19	24	15	8
	Fever, remittent	29	14	6	4	0	2	12	4	9	6	9	19	3	0	6
	Fever, typhoid enteric)	18	11	22	12	13	14	16	7	20	18	34	29	33	35	25
	Fever, typho-malarial	15	5	1	0	0	0	0	0	0	0	7	6	0	0	0
	Influenza	41	40	33	88	94	75	40	27	31	12	7	6	0	17	22
	Kidney, inflammation of	21	19	14	4	3	9	20	27	20	24	9	19	0	15	11
	Measles	13	7	4	0	3	0	8	0	0	0	2	0	0	15	17
	Neuralgia	50	45	47	42	43	43	68	58	43	55	36	48	39	44	56
	Pleuritis	13	13	14	15	13	23	20	11	20	21	9	6	3	15	17
	Pneumonia	30	18	15	50	45	23	28	9	6	0	0	0	6	19	8
	Puerperal fever	7	3	1	0	0	2	8	4	0	0	0	3	0	0	0
	Rheumatism	67	60	60	69	65	70	96	64	54	55	57	65	58	38	53
	Scarlet fever	19	9	9	19	23	7	20	4	3	0	0	6	18	13	6
	Smallpox	2	0.5	0.2	0	0	0	0	0	3	0	0	0	0	0	0
	Tonsillitis	43	39	39	54	58	32	64	38	23	33	30	29	30	48	39
	Whooping-cough	18	7	2	0	3	0	0	0	0	0	0	0	0	10	6

*, †, d. These notes on page 75. ‡Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 19 years, 1880-98; for neuralgia and tonsillitis, an average for the 20 years, 1879-98; pleuritis was not compiled until 1888; for other diseases and for the average line, an average for the 22 years, 1877-98.

TABLE 4.*—*A summary for the year 1899, relative to diseases in each of the 11 divisions of the State,—indicating the prevalence as regards both time and area.*

Diseases.	Upper Peninsular Division.†				Northwestern Division.†				Northern Division.†				Northeastern Division.†				Western Division.†			
	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. e
Av. for tab. dis. reported present.	28	63	18	2.9	18	60	11	2.2	29	67	20	2.8	21	68	18	2.7	29	63	19	2.9
Brain, inflammation of	4	38	1	6.0	0	0	0	0	8	29	2	3.5	7	35	3	4.3	6	33	2	3.8
Bowels, inflammation of	23	33	7	3.7	3	25	0.9	2.5	23	44	12	3.9	35	41	18	3.2	24	51	11	3.5
Bronchitis	75	75	58	2.6	37	74	27	2.5	82	81	67	2.5	65	72	59	2.1	71	72	51	2.6
Cerebro-spinal meningitis	19	60	12	2.7	17	43	7	2.4	10	32	3	3.9	0	0	0	0	11	40	5	4.4
Cholera infantum	21	57	14	2.6	12	46	5	2.6	14	64	10	2.9	4	22	1	2.5	13	61	8	2.8
Cholera morbus	14	42	6	2.8	12	32	4	2.4	13	55	8	2.6	13	43	7	2.0	19	44	8	2.9
Consumption, pulmonary	35	83	28	2.7	25	84	22	1.5	39	92	35	2.6	4	33	1	2.0	30	73	23	3.7
Croup, membranous	14	31	5	4.3	0	0	0	0	0	0	0	0	0	0	0	0	4	33	1	3.8
Diphtheria	7	47	3	3.3	3	63	2	2.0	4	45	2	2.7	0	0	0	0	7	60	4	4.3
Diarrhea	63	72	47	2.3	42	66	27	2.3	56	64	36	2.7	54	66	45	2.7	55	66	37	2.6
Dysentery	14	32	5	3.5	20	50	11	1.9	27	69	20	2.6	9	26	3	3.8	24	51	12	2.8
Erysipelas	14	48	7	4.4	17	40	7	3.0	30	59	17	3.3	26	82	27	4.1	35	44	15	3.6
Fever, intermittent	0	0	0	0	2	25	0.5	1.0	16	42	6	3.3	19	56	13	3.0	41	56	23	2.5
Fever, remittent	2	33	0.5	2.0	10	65	7	3.0	14	45	7	4.6	22	65	19	2.6	38	61	24	3.2
Fever, typhoid (enteric)	32	61	20	3.6	12	43	6	2.1	6	67	5	3.2	0	0	0	0	13	48	6	3.1
Fever, typho-malarial	0	0	0	0	0	0	0	0	3	89	3	2.5	0	0	0	0	5	33	2	2.8
Influenza	58	73	43	1.6	32	69	20	1.7	60	86	52	1.7	43	86	46	1.7	61	78	48	1.7
Kidney, inflammation of	33	68	22	3.4	7	43	3	2.5	31	57	18	3.5	39	72	37	3.0	30	57	16	3.8
Measles	18	56	9	3.5	27	48	13	1.4	18	52	9	2.1	6	44	2	1.7	19	61	12	2.1
Neuralgia	68	60	44	2.9	54	79	40	1.8	78	74	59	2.5	50	74	48	2.6	74	75	56	2.3
Pleuritis	23	44	11	3.3	27	32	8	2.9	44	50	22	3.7	37	72	34	3.5	30	40	12	3.7
Pneumonia	53	55	30	3.9	24	46	11	2.9	38	43	17	3.3	19	83	19	2.6	39	56	22	3.5
Puerperal fever	14	45	7	3.6	5	55	3	2.0	1	20	0.3	2.0	7	47	4	2.8	6	31	2	4.4
Rheumatism	70	64	48	3.2	58	83	45	2.2	88	84	75	2.5	63	78	62	2.3	77	81	62	2.3
Scarlet fever	9	67	6	3.6	15	58	8	2.1	26	67	17	2.7	4	50	2	2.0	20	52	11	3.7
Smallpox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	68	72	51	2.7	47	51	23	2.3	73	61	45	3.0	57	61	45	3.0	69	68	47	2.7
Whooping-cough	25	76	19	2.0	5	60	3	1.0	8	52	4	3.3	4	100	4	1.0	8	66	6	2.9

*Table 3 is manuscript, not printed for lack of space. †Counties in each division are stated in Exhibit I, in preceding reports.
b, c, d, e. Foot-notes with these marks are below Table 2.

TABLE 4.—CONCLUDED.

Diseases.	Northern Central Division.*				Bay and Eastern Division.*				Central Division.*				Southwestern Div.*				Southern Central Division.*				Southeastern Div.*			
	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. e	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c.	Per cent of reports stating presence of. d	Av. order of prevalence where present. e.	Per cent of observers reporting presence of. b	Av. per cent of. weeks reported present where present. e	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c.	Per cent of reports stating presence of. d	Av. order of prevalence where present. e	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. c.	Per cent of observers reporting presence of. b	Av. per cent of weeks reported present where present. c	Per cent of reports stating presence of. d	Av. order of prevalence where present. e
Av. for tab. dis. rep. present...	20	62	13	2.3	25	65	17	3.1	27	68	18	2.9	27	69	19	3.1	25	66	17	2.7	24	63	16	2.1
Brain, inflammation of.........	4	36	1	3.7	5	28	1	6.1	4	28	1	3.4	2	25	0.5	3.0	4	38	1	3.3	10	33	3	2.5
Bowels, inflammation of.	14	34	4	2.5	25	58	13	4.2	18	49	9	4.0	26	37	11	4.4	23	48	11	3.2	22	41	9	2.3
Bronchitis.....................	60	72	42	2.2	68	80	54	2.4	64	82	54	2.6	57	79	47	2.8	60	73	44	2.7	65	70	46	2.2
Cerebro-spinal meningitis.....	8	58	5	3.0	3	31	0.7	5.3	8	38	3	2.9	6	41	2	5.2	3	36	1	2.0	5	30	2	2.5
Cholera infantum.............	10	47	5	2.6	18	61	11	3.2	14	48	7	2.8	16	60	10	4.4	16	56	10	3.7	10	48	4	2.1
Cholera morbus................	14	46	7	2.3	19	58	12	3.0	20	51	11	2.9	28	55	16	3.8	21	57	12	3.1	19	57	10	2.3
Consumption, pulmonary......	30	76	23	1.8	17	52	9	3.1	41	85	34	3.5	16	65	10	3.6	25	69	18	2.6	23	82	19	2.0
Croup, membranous............	0	0	0	0	0.7	25	0.2	5.0	1	27	0.3	3.3	2	29	0.5	2.0	0.9	22	0.2	5.0	4	33	1	2.6
Diphtheria.....................	0	0	0	0	3	64	3	3.2	7	32	2	3.7	9	56	5	3.2	5	44	2	4.3	9	56	5	2.1
Diarrhea.......................	53	58	29	2.2	59	66	39	2.5	61	64	39	2.6	43	67	31	3.3	54	67	36	2.5	53	64	34	1.9
Dysentery......................	16	52	9	2.8	23	63	15	3.8	26	56	15	3.1	20	54	12	4.0	25	52	13	3.1	26	52	14	2.5
Erysipelas....................	16	38	7	2.8	26	41	11	4.3	16	46	7	4.2	25	50	14	4.4	14	36	5	3.3	11	46	5	2.5
Fever, intermittent...........	40	65	27	2.1	23	50	11	4.2	33	57	20	3.1	46	82	41	2.8	25	56	14	2.8	27	51	14	2.6
Fever, remittent..............	9	39	4	3.0	21	42	8	3.9	23	55	13	3.3	33	52	19	4.1	21	53	11	2.9	13	38	6	2.5
Fever, typhoid (enteric)........	11	61	6	2.4	8	40	4	2.7	17	65	11	3.1	4	50	2	4.5	15	56	9	3.5	31	73	22	1.9
Fever, typho-malarial...	3	22	0.7	2.0	0.7	33	0.2	5.0	5	42	2	1.9	6	46	3	4.7	0.9	38	0.3	1.0	2	56	1	2.0
Influenza......................	33	64	21	2.0	57	79	48	1.6	56	83	47	1.8	67	83	58	1.9	49	73	36	1.8	52	62	33	1.7
Kidney, inflammation of.......	13	51	7	2.9	36	64	23	4.0	30	67	23	3.4	40	72	31	3.9	35	59	21	2.9	26	53	14	2.8
Measles........................	14	54	7	1.4	8	53	4	2.1	13	49	6	2.8	14	58	8	2.4	4	38	1	3.7	9	45	4	1.5
Neuralgia......................	55	71	40	2.4	67	76	52	2.6	73	83	60	2.5	77	83	66	2.6	77	81	63	2.2	58	82	47	2.0
Pleuritis.......................	19	40	7	3.1	37	59	23	4.1	31	53	17	3.7	26	45	13	3.8	26	48	13	3.5	26	53	14	2.4
Pneumonia.....................	19	54	10	2.7	28	50	15	3.7	30	58	18	3.8	33	60	20	3.9	29	55	16	3.6	27	54	15	2.2
Puerperal fever................	4	30	1	3.3	3	24	0.9	4.8	7	40	3	3.4	1	67	0.5	3.0	4	28	1	3.5	4	30	1	2.2
Rheumatism....................	58	81	48	1.9	66	85	57	2.8	75	87	65	2.2	81	89	74	2.3	85	84	72	2.1	71	86	60	1.9
Scarlet fever..................	8	46	4	3.7	17	57	10	2.8	11	56	6	3.7	10	77	7	2.7	12	46	5	3.0	18	57	9	2.3
Smallpox.......................	0	0	0	0	1	43	0.6	7.5	0	0	0	0	4	88	4	1.8	0.9	100	0.6	9.0	0.9	50	0.2	2.0
Tonsillitis.............	53	67	35	2.7	65	65	43	3.0	57	68	39	3.0	62	60	38	2.8	71	69	49	2.5	63	61	39	2.3
Whooping-cough...............	6	87	4	1.8	6	53	3	3.0	6	69	4	1.7	2	60	0.8	1.5	2	29	0.6	4.8	3	67	2	1.3

*Counties in each division are stated in Exhibit 1, in preceding reports. b. c. d. e. Foot-notes with these marks are below Table 2.

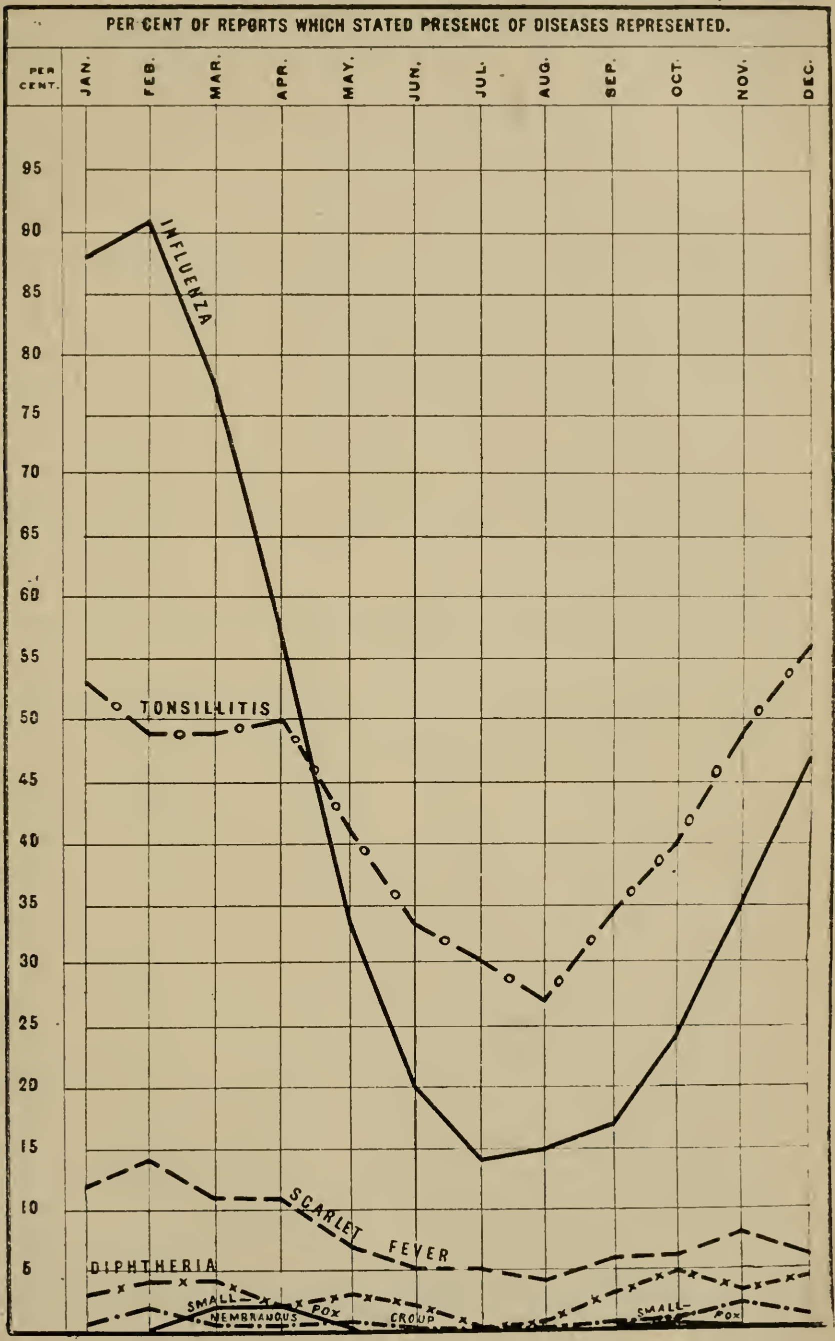
DISEASES IN MICHIGAN, ARRANGED IN ORDER OF PREVALENCE, THOSE WHICH CAUSED MOST SICKNESS FIRST.

EXHIBIT A.—*Order of prevalence of 28 diseases in Michigan, in the period of 13 years, 1887-1899, and in each of those years, judging from the "per cent of reports," which stated the presence of each of the diseases, in connection with the reported "order of prevalence" when and where each disease was present. (The method of rating diseases for this exhibit is described and illustrated in a "compiling table" on pages 122 and 123 of the annual report for 1890.)*

Order, 1887-99.	Diseases arranged in order of greatest prevalence.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.
1	Rheumatism	1	1	1	1	3	1	1	2	2	1	1	1	1
2	Neuralgia	3	3	3	2	1	2	2	1	3	2	2	2	2
3	Bronchitis	4	4	4	4	4	3	4	3	4	3	3	3	3
4	Influenza	2	2	2	3	2	4	3	4	1	4	8	8	8
5	Diarrhea	6	5	6	6	5	5	6	5	5	5	4	6	6
6	Tonsillitis	5	6	5	5	6	6	5	6	6	7	7	7	7
7	Intermittent fever	9	8	10	8	7	8	7	7	8	8	5	4	5
8	Consumption, pulmonary	7	10	11	7	10	7	8	9	7	6	6	5	4
(9)	(The average disease)	8	9	10	7	8	9	10	9	10	9	10	11	11
9	Remittent fever	19	12	20	9	9	9	9	8	9	9	9	9	9
10	Whooping-cough	10	9	8	11	8	10	11	10	10	13	11	20	19
11	Measles	8	11	7	14	18	11	10	16	11	11	22	12	16
12	Pneumonia	16	18	18	10	16	16	12	11	13	10	10	10	10
13	Cholera morbus	12	23	14	12	11	12	13	14	12	12	15	15	12
14	Dysentery	11	15	16	13	13	13	17	17	17	14	13	13	13
15	Inflammation of kidney	14	17	21	16	14	17	16	12	14	15	14	16	15
16	Cholera infantum	17	14	13	17	12	15	15	15	15	17	18	18	18
17	Erysipelas	23	20	22	20	23	21	21	21	19	15	12	11	11
18	Typhoid fever (enteric)	13	16	25	19	17	18	14	20	16	20	20	21	21
19	Scarlet fever	18	13	19	18	19	14	19	13	22	22	21	22	22
20	Typho-malarial fever	15	24	12	21	20	23	22	22	20	19	17	14	14
21	Pleuritis*	20	19	26	15	21	22	20	19	18	18	16	17	.....
22	Inflammation of bowels	21	21	23	22	22	20	23	23	21	21	19	19	17
23	Diphtheria	24	22	15	24	27	19	18	18	23	23	24	23	20
24	Smallpox	28	7	9	28	15	26	28	28	28	28	28	28	27
25	Puerperal fever	25	25	24	23	24	24	24	26	25	24	23	24	23
26	Membranous croup	27	28	17	26	28	27	25	27	24	25	26	26	25
27	Cerebro-spinal meningitis	22	26	28	25	25	25	27	24	27	26	25	25	26
28	Inflammation of brain	26	27	27	27	26	28	26	25	26	27	27	27	24

*Pleuritis was not compiled until 1888.

DIAGRAM 2—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1899.



[PLATE 1063.]

Diseases which cause most sickness in Michigan.—This is shown in this report in Exhibit A, and more specifically in Exhibit III, in this report, and in similar exhibits in previous reports. The question is differently answered in different years. For many years after the compilation of weekly reports was begun, intermittent fever appeared to be the leading cause of sickness in Michigan.

By Exhibit A, one may see that in the years 1887-90 rheumatism, in 1891 influenza, in 1892 neuralgia, in 1893-94 rheumatism, in 1895 neuralgia, and in 1896-9 rheumatism appeared to have caused most sickness in Michigan. This does not necessarily imply that there was an increase in rheumatism or neuralgia, because one disease *may* exhibit a higher relative order of prevalence on account of some other disease or diseases having been actually lessened in prevalence.

The "average disease" of those reported, is included in Exhibit A, as a standard by which to judge the fluctuations. It may be seen that in 1891, the "average disease" was lower (10) by one-tenth, than the average (9) of a series of years; in 1892 it was raised to the average; in 1893 it was one-tenth lower than the average; in 1894 it was raised to the average; in 1895 it was one-tenth higher, and in 1896 it was two-tenths higher than the average; in 1897 it was one-tenth lower than the average; in 1898 it was raised to the average, and in 1899 it was one-tenth higher than the average.

In this connection it should be stated that the average number of diseases reported on each card gradually decreased during the years 1890-98. This is shown in Exhibit B, as follows:—

EXHIBIT B.—*Stating for each of the 11 years, 1889-99, the number of card reports received, the total number of disease reports and the average number of diseases reported on each card; also the averages for the 10 years, 1889-98.*

Year.	Number of card reports received.	Number of disease reports.	Av. number of diseases on each card.
1889	5,000	32,612	6.52
1890	4,939	33,934	6.87
1891	4,291	28,741	6.70
1892	5,281	31,269	5.92
1893	5,853	32,723	5.59
1894	5.572	30,619	5.50
1895	4,394	24,004	5.46
1896	3,940	19,443	4.93
1897	4,418	21,828	4.94
1898	5,219	24,946	4.78
Average for the 10 years, 1889-98	4,891	28,012	5.73
1899	5,126	24,700	4.82

EXHIBIT III.—*Diseases from which there seems to have been the most sickness in Michigan in 1899, as indicated by the per cent of weekly reports stating presence of the diseases, as studied in connection with the average order of prevalence of said diseases when reported present; also order, per cent of reports and average order for the same diseases in 1898, 1897, 1896 and 1895.*

	1899.				1898.			1897.			1896.			1895.		
	Order.*	Diseases in order of apparent amount of sickness in 1899. Most prevalent disease first.	Per cent of reports stating presence of. d	Av. order of prevalence when present. e	Order.*	Per cent of reports stating presence of. d	Av. order of prevalence when present. e	Order.*	Per cent of reports stating presence of. d	Av. order of prevalence when present. e	Order.*	Per cent of reports stating presence of. d	Av. order of prevalence when present. e	Order.*	Per cent of reports stating presence of. d	Av. order of prevalence when present. e
More sickness than av. for 28 diseases.	1	Rheumatism	63	2.3	1	62	2.2	1	66	2.3	1	60	2.3	3	60	2.7
	2	Influenza	42	1.7	2	45	1.7	2	47	1.8	3	44	1.8	2	44	2.0
	3	Neuralgia	56	2.4	3	54	2.3	3	58	2.4	2	54	2.3	1	56	2.5
	4	Bronchitis	50	2.5	4	49	2.5	4	50	2.6	4	51	2.4	4	52	2.6
	5	Tonsillitis	42	2.7	6	40	2.7	5	43	2.6	5	45	2.6	6	43	3.0
	6	Diarrhea	37	2.5	5	36	2.4	6	34	2.5	6	34	2.5	5	42	2.5
	7	Consumption, pulmonary	22	2.9	10	20	2.9	11	20	3.1	7	23	3.0	10	29	3.5
	(8)	Average	17	2.8	(9)	17	2.6	(10)	18	2.7	(9)	18	2.7	(8)	20	3.0
Less than said average.	8	Measles	6	2.3	11	7	2.7	7	13	2.3	14	7	2.7	18	4	3.1
	9	Intermittent fever	17	2.9	8	19	2.6	10	17	2.7	8	19	2.7	7	22	2.9
	10	Whooping-cough	4	2.3	9	5	2.4	8	4	2.1	11	7	2.4	8	9	2.6
	11	Dysentery	13	3.0	15	12	3.0	16	12	3.2	13	11	3.0	13	15	3.2
	12	Cholera morbus	10	2.9	23	12	2.7	14	10	3.0	12	11	2.9	11	15	3.0
	13	Typhoid fever (enteric)	9	2.9	16	8	2.9	25	7	3.3	19	10	3.3	17	13	3.4
	14	Inflammation of kidney	19	3.4	17	17	3.2	21	17	3.4	16	16	3.5	14	20	3.6
	15	Typho-malarial fever	1	2.6	24	2	3.1	12	0.9	2.7	21	2	2.8	20	4	3.2

*Judging from the per cent of reports which stated presence of the disease in connection with the order of prevalence when present. The method of rating diseases. as causes of sickness, as shown in Exhibits VI and VII, is fully described and illustrated by a "compiling table" on pages 122 and 123 of the annual report for the year 1890.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received, for the time specified, from *all observers* in the State. It combines and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1, in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the order of prevalence columns in Table 3 (omitted from this report because of lack of room), by the number of observers who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of observers who reported the different diseases present, thus counting each observer once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present, by each observer, from week to week, the greater will be the average in this column.

EXHIBIT IV.—*In each of 11 geographical divisions of the State the 15 diseases from which there seems to have been the greatest amount of sickness in 1899, as indicated by the per cent of weekly reports stating presence of each of 28 leading diseases, when studied in connection with the average order of prevalence of said diseases when reported present.*

	Order.*	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of.d	Av. order of prevalence when pres. e	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of.d	Av. order of prevalence when pres. e	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of.d	Av. order of prevalence when pres. e
		UPPER PENINSULAR DIVISION.†			NORTHWESTERN DIVISION.†			NORTHERN DIVISION.†		
More sickness than av. for 28 diseases.	1	Bronchitis	58	2.6	Neuralgia	40	1.8	Rheumatism	75	2.5
	2	Influenza	43	1.6	Rheumatism	45	2.2	Influenza	52	1.7
	3	Diarrhea	47	2.3	Consumption, pul.	22	1.5	Bronchitis	67	2.5
	4	Tonsillitis	51	2.7	Influenza	20	1.7	Neuralgia	59	2.5
	5	Neuralgia	44	2.9	Measles	13	1.4	Consumption, pul.	35	2.6
	6	Rheumatism	48	3.2	Whooping-cough	3	1.0	Tonsillitis	45	3.0
	7	Whooping-cough	19	2.0	Intermittent fever.	0.5	1.0	Diarrhea	36	2.7
	8	Consumption, pul.	28	2.7	Diarrhea	27	2.3	Measles	9	2.1
	(9)	Average	18	2.9						
	9	Cholera infantum	14	2.6	Tonsillitis	23	2.3	Dysentery	20	2.6
	10	Pneumonia	30	3.9	Bronchitis	27	2.5	Puerperal fever	0.3	2.0
	(11)							Average	20	2.8
Less than said average.	11	Inflam. of kidney	22	3.4	Dysentery	11	1.9	Scarlet fever	17	2.7
	(12)				Average	11	2.2			
	12	Cerebro-spi. men.	12	2.7	Scarlet fever	8	2.1	Cholera morbus	8	2.6
	13	Remittent fever	0.5	2.0	Typhoid fev. (ent.).	6	2.1	Typho-mal. fever	3	2.5
	14	Typhoid fev. (ent.)	20	3.6	Puerperal fever	3	2.0	Cholera infantum	10	2.9
	15	Cholera morbus	6	2.8	Diphtheria	2	2.0	Diphtheria	2	2.7
		NORTHERN CENTRAL DIVISION.†			WESTERN DIVISION.†			NORTHEASTERN DIVISION.†		
More sickness than av. for 28 diseases.	1	Rheumatism	48	1.9	Rheumatism	62	2.3	Bronchitis	59	2.1
	2	Bronchitis	42	2.2	Influenza	48	1.7	Rheumatism	62	2.3
	3	Neuralgia	40	2.4	Neuralgia	56	2.3	Influenza	46	1.7
	4	Consumption, pul.	23	1.8	Bronchitis	51	2.6	Neuralgia	48	2.6
	5	Diarrhea	29	2.2	Tonsillitis	47	2.7	Diarrhea	45	2.7
	6	Intermittent fever	27	2.1	Diarrhea	37	2.6	Tonsillitis	45	3.0
	7	Influenza	21	2.0	Intermittent fever.	23	2.5	Whooping-cough	4	1.0
	8	Tonsillitis	35	2.7	Measles	12	2.1	Inflam. of kidney	37	3.0
	(9)				Average	19	2.9			
	9	Measles	7	1.4	Remittent fever	24	3.2	Pneumonia	19	2.6
	10	Whooping-cough	4	1.8	Dysentery	12	2.8	Remittent fever	19	2.6
	(11)	Average	13	2.3						
Less than said average.	11	Cholera morbus	7	2.3	Cholera infantum	8	2.8	Measles	2	1.7
	12	Typho-mal. fever	0.7	2.0	Pneumonia	22	3.5	Cholera morbus	7	2.0
	13	Typhoid fev. (ent)	6	2.4	Cholera morbus	8	2.9	Pleuritis	34	3.5
	(14)							Average	18	2.7
	14	Pneumonia	10	2.7	Whooping-cough	6	2.9	Scarlet fever	2	2.0
	15	Inflam. of bowels	4	2.5	Consumption, pul.	23	3.7	Consumption, pul.	1	2.0

EXHIBIT IV.—CONCLUDED.

	Order.*	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of.d	Av. order of prevalence when pres. e	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of.d	Av. order of prevalence when pres. e	Diseases in order of apparent amount of sickness. Most prevalent disease first.	Per cent of reports stating presence of.d	Av. order of prevalence when pres. e
		BAY AND EASTERN DIVISION.†			CENTRAL DIVISION.†			SOUTHWESTERN DIVISION.†		
More sickness than av. for 28 diseases.	1	Influenza	48	1.6	Rheumatism	65	2.2	Rheumatism	74	2.3
	2	Bronchitis	54	2.4	Influenza	47	1.8	Influenza	58	1.9
	3	Rheumatism	57	2.8	Neuralgia	60	2.5	Neuralgia	66	2.6
	4	Neuralgia	52	2.6	Bronchitis	54	2.6	Bronchitis	47	2.8
	5	Diarrhea	39	2.5	Diarrhea	39	2.6	Intermittent fever	41	2.8
	6	Tonsillitis	43	3.0	Tonsillitis	39	3.0	Tonsillitis	38	2.8
	(7)	Average	17	3.1	....	....	....	....	....	....
	7	Inflam. of kidney	23	4.0	Whooping-cough	4	1.7	Whooping-cough	0.8	1.5
	8	Measles	4	2.1	Typho-mal. fever	2	1.9	Smallpox	4	1.8
	9	Pleuritis	23	4.1	Consumption, pul.	34	3.5	Diarrhea	31	3.3
	(10)	....	....	....	Average	18	2.9	....	....	....
Less.	10	Cholera morbus	12	3.0	Intermittent fever	20	3.1	Membran. croup	0.5	2.0
	11	Scarlet fever	10	2.8	Cholera morbus	11	2.9	Measles	8	2.4
	(12)	....	....	....	....	....	....	Average	19	3.1
	12	Cholera infantum	11	3.2	Inflam. of kidney	23	3.4	Inflam. of kidney	31	3.9
	13	Pneumonia	15	3.7	Dysentery	15	3.1	Scarlet fever	7	2.7
	14	Consumption, pul.	9	3.1	Cholera infantum	7	2.8	Pneumonia	20	3.9
	15	Dysentery	15	3.8	Measles	6	2.8	Diphtheria	5	3.2
		SOUTHERN CENTRAL DIVISION.†			SOUTHEASTERN DIVISION.†					
More sickness than av. for 28 diseases.	1	Rheumatism	72	2.1	Rheumatism				60	1.9
	2	Neuralgia	63	2.2	Neuralgia				47	2.0
	3	Tonsillitis	49	2.5	Influenza				33	1.7
	4	Bronchitis	44	2.7	Bronchitis				46	2.2
	5	Influenza	36	1.8	Diarrhea				34	1.9
	6	Diarrhea	36	2.5	Whooping-cough				2	1.3
	7	Inflam. of kidney	21	2.9	Tonsillitis				39	2.3
	8	Consumption, pul.	18	2.6	Typhoid fever (enteric)				22	1.9
	(9)	Average	17	2.7	....				....	....
	9	Typho-mal. fever	0.3	1.0	Measles				4	1.5
	10	Intermittent fever	14	2.8	Consumption, pulmonary				19	2.0
	(11)	....	....	....	Average				16	2.1
Less.	11	Dysentery	13	3.1	Pneumonia				15	2.2
	12	Cerebro-spi. men.	1	2.0	Diphtheria				5	2.1
	13	Remittent fever	11	2.9	Cholera infantum				4	2.1
	14	Cholera morbus	12	3.1	Typho-malarial fever				1	2.0
	15	Pneumonia	16	3.6	Smallpox				0.2	2.0

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*, d, e. Foot-notes with these marks are under Exhibit III.

†The counties in each division are stated in Exhibit I, in preceding reports.

EXHIBIT V.—*Showing comparisons between the averages of certain meteorological conditions at the stations in Michigan in 1899, with those in preceding years. (Abstracted from Exhibits 8, 12, 14, 15, 18, 21, 22, 23, 24 and 27, on preceding pages of this report.)*

Meteorological conditions.		Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average temperature	In 1899 higher than av. for 22 years, 1877-98	.74	.55	......	......	4.38	2.75	2.68	......	3.85	......	3.97	4.90	......
	Lower	......	......	6.37	3.27	......	......	......	.41	......	3.15	......	......	1.02
Av. daily range of temp.	In 1899 greater than av. for 20 years, 1879-98	.18	......	.15	......	.94	......	1.44	......	2.43	......	1.77	......	......
	Less	......	.06	......	2.17	......	.13	......	.71	......	.29	......	.39	.80
Absolute humidity	In 1899 more than av. for 22 years, 1877-98	.07	......	......	......	.45	.39	.10	.01	.12	......	.45	.40	......
	Less	......	.05	.31	.31	......	......	......	......	......	.36	......	......	.10
Relative humidity	In 1899 more than av. for 21 years, 1878-98	1	......	......	4	1	4	......	4	......	=	3	=	......
	Less	......	2	3	......	......	......	2	......	3	=	......	=	1
Cloudiness	In 1899 greater than av. for 22 years, 1877-98	......	......	......	16	......	1	......	7	......	8	......	......	......
	Less	3	8	11	......	5	......	11	......	11	......	14	2	5
Rainfall	In 1899 more than av. for 22 years, 1877-98	......	......	......	.84	......	......	......	.36	......	......	......	......	......
	Less	6.81	.60	1.05	......	1.24	.40	.70	......	1.86	.03	.26	1.67	.24
Day ozone	In 1899 more than av. for 22 years, 1877-98	......	......	......	.11	......	......	......	......	......	......	......	......	......
	Less	.44	.06	.47	......	.27	.12	.53	.56	.46	.58	.91	.67	.72
Night ozone	In 1899 more than av. for 22 years, 1877-98	......	......	......	.29	......	.23	......	......	.09	......	......	......	......
	Less	.20	.48	.53	......	.02	......	.12	.04	......	.09	.66	.59	.73
Velocity of wind	In 1899 greater than av. for 17 years, 1882-98	......	1.1	......	.4	......	......	1.0	......	......	.2	......	......	.9
	Less	.4	......	1.6	......	1.1	.3	......	.4	.3	......	1.2	2.6	......
Atmospheric pressure	In 1899 greater than av. for 22 years, 1877-98	.029	.030	......	......	.042	.076	.100	.029	.025	.024	.128	.049	......
	Less	......	......	.046	.077	......	......	......	......	......	......	......	......	.035

CLIMATE AND SICKNESS.*

Exhibit VII (and similar exhibits in previous reports) is an attempt to learn something of the relations of bronchitis to meteorological conditions. by noting whether each meteorological condition was above or below its average for the year, in months when more or in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the prevalence of bronchitis; those months in which most bronchitis was reported being placed first in the column; those in which more bronchitis than the average was reported are placed above the average line; the others below that line. The meteorological conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its annual average in months when more than the average amount of bronchitis was reported, or *vice versa.*

That the comparisons may the more readily be held in mind, propositions have been made concerning the relations of bronchitis to meteorological conditions, grouping the conditions into two classes. The letters *a* and *b* in the exhibit mark exceptions to these propositions. It is not supposed that the propositions are in every case true concerning every disease; but the propositions serve to bring out the evidence of the exhibit on the subject in question. This evidence is appreciated by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit XI, near the close of this article.

Propositions similar to those relative to bronchitis, but relating to other diseases, are given on following pages. The propositions are differently stated for the summer diseases and for the winter diseases, but they are not changed to fit the individual diseases under each class.

*Relations of bronchitis and other "cold-weather" diseases to meteorological conditions.**

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, pneumonia, membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, pulmonary consumption or average disease, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit VII, the letter *a* marks exceptions to this proposition for the year 1899.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, pneumonia, membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis, pulmonary consumption or average disease, the average daily temperature, the average daily range of temperature,[*] the absolute humidity of the atmosphere and the average daily pressure of the atmosphere[*] were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibit VII, the letter *b* marks exceptions to this proposition for months in 1899.

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*A comparison of meteorological conditions in 1899, with the averages for series of years, is given in Exhibit V. of this article.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity exhaled daily in excess of that inhaled was **greater** than the average in months where **more** than the average per cent of reports stated presence of bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months when the per cent of reports stating presence of bronchitis was **less** than the average.

What per cent of the weekly reports received stated presence of pneumonia, and of seven of the other diseases mentioned in the two preceding propositions by months in the years 1877-99, is stated in Exhibit VIII.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877-99, is shown in the following exhibit:

EXHIBIT VI.—SICKNESS FROM BRONCHITIS, 1877-99.—*By year and months for each of the 23 years, 1877-99, and an average for the 22 years, 1877-98, also for the 10 years, 1889-98; stating on what per cent of the weekly reports received bronchitis was reported present, and comparing the per cents of 1899, with the averages for corresponding months in those years.*

Years, etc.	Annual av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average, 22 years, 1877-98	58	71	72	71	68	58	49	41	40	46	53	62	66
Average, 10 years, 1889-98	54	66	67	66	65	54	46	38	39	44	51	58	62
1877	55	76	72	72	65	45	31	25	22	37	48	71	77
1878	64	77	75	74	71	65	56	41	45	55	60	73	81
1879	64	83	87	83	78	65	54	40	41	50	59	65	77
1880	64	81	84	82	68	59	57	44	45	46	57	67	72
1881	62	86	86	80	78	62	53	38	37	44	44	66	68
1882	65	73	70	75	74	70	62	51	44	57	59	71	71
1883	66	77	80	82	76	70	62	56	53	53	57	61	69
1884	61	71	71	71	65	59	56	48	47	50	56	69	70
1885	56	73	74	76	73	56	52	44	39	45	51	58	64
1886	56	71	69	71	65	57	45	40	37	41	51	61	65
1887	55	67	69	67	62	57	49	41	38	47	57	57	61
1888	59	63	76	74	68	63	55	41	39	49	59	59	65
1889	58	65	68	60	68	61	50	49	44	51	57	64	62
1890	65	71	74	76	74	66	56	50	52	54	65	73	79
1891	60	81	79	81	76	64	48	43	36	44	48	57	68
1892	54	72	70	64	67	56	47	37	38	42	50	57	63
1893	53	67	67	62	64	54	42	35	34	39	48	61	62
1894	50	63	60	61	58	49	42	32	36	43	52	53	57
1895	52	66	71	70	66	56	47	34	34	35	44	52	52
1896	51	59	60	59	56	45	39	36	35	46	53	59	61
1897	50	59	66	63	60	46	46	35	40	41	43	47	53
1898	49	58	51	54	56	47	38	33	38	41	52	59	64
1899	50	63	62	59	60	53	37	38	32	43	48	52	59
In 1899 **less** than average 1877-98	8	8	10	12	8	5	12	3	8	3	5	10	7
In 1899 **less** than average 1889-98[†]	4	3	5	7	5	1	9	=	7	1	3	6	3

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[*] The statements relative to the average daily range of temperature and the average daily pressure of the atmosphere were taken from proposition 1 and inserted in proposition 2 in the statistical study of sickness in Michigan in 1893, annual report for 1894.

[†] This comparison is made because of change of plan of reports in May, 1885, as explained on a preceding page in this article.

EXHIBIT VII.—BRONCHITIS.—*Stating for the year and for each month of the year 1899, what per cent of the weekly reports of sickness stated presence of bronchitis and what were the meteorological conditions as observed at stations in Michigan.**

BRONCHITIS.				Temperature F.		Humidity of air.§ Av. of 3 daily observations.		Vapor inhaled and exhaled from the air passages by one person in 24 hours, troy ounces.			Ozone, relative scale of 10°.			Atmospheric pressure, inches. Reduced to 32° F.		
														Range.		
	Months in order of greatest per cent of weekly reports stating presence of.	Per cent of weekly reports stating presence of.	Av. order of prevalence where present.†, ‡	Av. daily range by registering thermometers.	Average of three daily observations.	Relative per cent of saturation.	Absolute—grains of vapor in a cubic foot of air.	Inhaled.‖	Exhaled in excess of that inhaled.¶	Average per cent of cloudiness.	Day observation, 7 a. m. to 2 p. m.	Night observation, 9 p. m. to 7 a. m.	Av. velocity of wind, miles per hour by anemometer.	Monthly and for year.	Av. daily, by 3 daily observations.**	Average pressure.
More than av. per cent of bronchitis.	Jan.....	63	2.5	15.28	22.20	81	1.40	.88	10.80	63	3.65	3.50	12.1	1.245	.282	*b* 29.175
	Feb	62	2.6	16.93	17.09	79	1.22	.76	10.92	55	3.36	3.80	9.3	1.105	.212	29.102
	April...	60	2.3	*b*20.01	*b*49.17	*a* 72	3.28	2.05	9.63	*a* 47	3.34	3.99	9.3	*a*.719	*a*.136	*b*29.163
	March..	59	2.4	15.16	26.89	82	1.53	.96	10.72	73	3.95	4.58	11.2	.974	.302	29.054
	Dec	59	2.2	12.36	26.83	82	1.69	1.06	19.62	69	*a* 2.81	*a* 3.20	11.9	1.117	.229	29.106
	May....	53	2.3	*b*20.13	*b*59.00	*a* 74	*b*4.40	2.75	8.93	*a* 51	3.61	4.21	*a* 9.2	*a* .647	*a* .141	*b*29.165
	Nov....	52	2.3	13.74	41.03	80	2.72	1.70	9.98	68	*a* 2.56	*a* 2.91	*a* 8.3	.965	*a* .178	*b*29.193
Av........		50	2.5	18.16	47.14	77	3.54	2.21	9.47	53	3.04	3.49	9.3	.802	.179	29.160
Less than av. per cent of bronchitis.	Oct.....	48	2.6	19.02	53.28	*a* 79	3.95	2.47	9.21	43	2.28	2.67	8.4	.698	.144	29.278
	Sept....	43	2.9	19.89	58.51	76	4.58	2.86	8.82	52	2.55	2.93	8.9	.706	.169	29.195
	July....	38	2.8	20.39	70.54	75	6.09	3.81	7.87	47	2.46	3.05	7.4	.389	.102	*b*29.140
	June ...	37	2.3	22.19	69.13	71	5.68	3.55	8.13	35	2.94	*a* 3.58	8.9	.517	.140	29.192
	Aug....	32	3.1	22.85	71.98	70	5.89	3.68	8.00	31	3.01	3.44	7.3	.540	.110	*b*29.154

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*Statements relative to meteorological conditions may be found in an article on the principal meteorological conditions in Michigan in 1899, on pages 1-57 of this report.

†Explanations of statements in this and the preceding columns, and other statements relative to the prevalence in 1899, of the diseases under consideration may be found in Tables 2 and 4 of this article, and also in Diagrams 1, 2, 3, 4 and 5. When the per cent of reports stated for any disease is the same for two months or for any month is the same as the average, the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

‡Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

§Calculated from readings of dry bulb and wet bulb thermometers.

‖Calculated for 18 respirations per minute, of 20 cubic inches of air each.

¶Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 troy ounces of vapor exhaled daily. No correction has been made for the expansion of air after it is inhaled.

**The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely, at 7 a. m., 2 p. m., 9 p. m. of one day, and 7 a. m. of the following day.

a An exception to the proposition that more than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was greater than the average for the year; and less in months when the same condition was less than the average. Proposition 1, relating to bronchitis and other "cold-weather" diseases, is on a preceding page in this article.

b An exception to the proposition that more than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was less than the average for the year and less in months when the same condition was greater than the average for the year. Proposition 2, relating to bronchitis and other "cold-weather" diseases, is on a preceding page in this article.

EXHIBIT VIII.—*By year and months for 1899, and for the preceding year, and an average for the 22 years, 1877-98,* also for the 10 years, 1889-98, stating on what per cent of the weekly reports received,* PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, NEURALGIA* AND TONSILLITIS,* *were reported present; and comparing the per cents for months in 1899 with the averages for corresponding months in the years specified.*

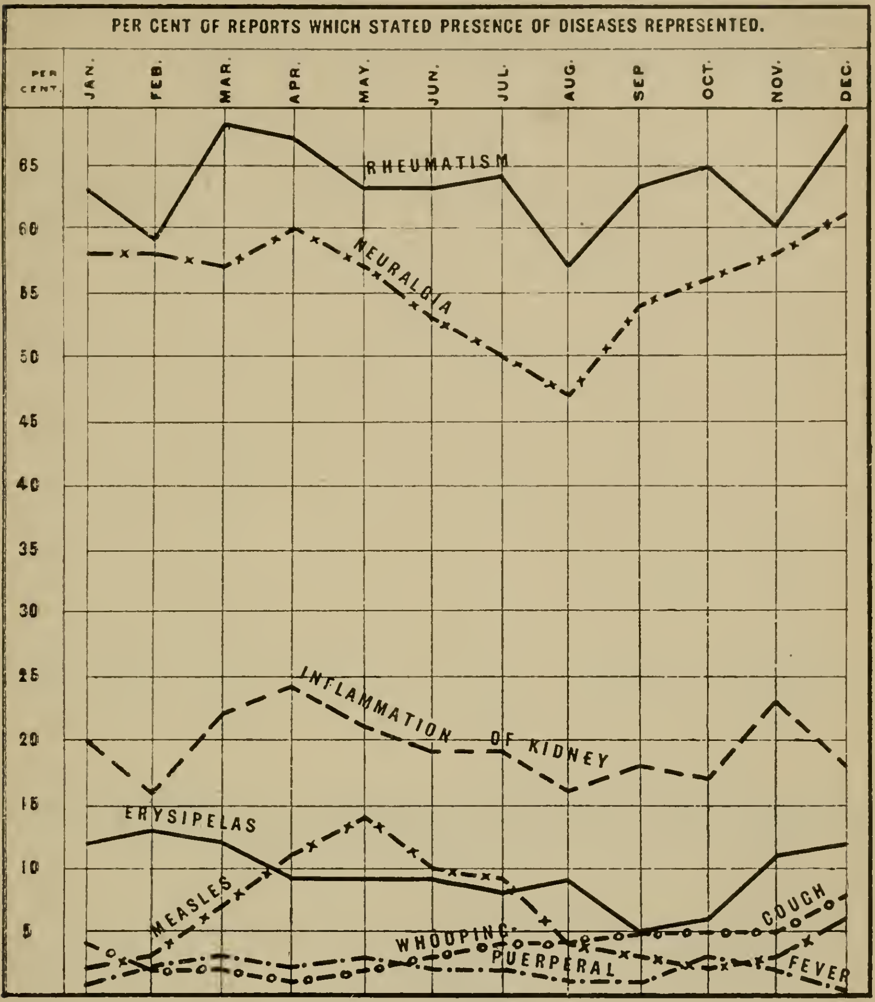
	Years, etc.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Pneumonia.	Av. 22 yrs., 1877-98.	29	49	52	50	43	32	19	12	10	13	18	27	36	Membranous croup.	4	8	7	5	5	4	2	1	2	2	4	6	7
	Av. 10 yrs., 1889-98.	23	41	42	38	33	24	12	8	7	9	14	21	28		2	4	4	3	3	2	1	1	0.6	0.9	2	3	3
	1898	17	32	34	28	29	20	9	5	3	8	11	16	22		0.5	1	1	1	1	0.4	0.2	0.2	0	0	0.5	0.4	0
	1899	17	37	46	35	26	15	6	3	2	6	7	12	15		0.6	0.5	2	0.6	0.3	0.6	0	0.2	0	0.5	0.8	2	1
	In 1899 greater than av. 1877-1898	..	..	..	..	..	..	..	...	...	..	..	..	..		...	...	..	...	...	...	...	...	...	...	...	...	..
	In 1899 less than av. 1877-98	12	12	6	15	17	17	13	9	8	7	11	15	21		3.4	7.5	5	4.4	4.7	3.4	2	0.8	2	1.5	3.2	4	6
	In 1899 greater than av. 1886-1898†	..	..	4	..	..	..	..	...	...	..	.	..	..		...	...	..	...	...	...	...	...	...	...	...	...	..
	In 1899 less than av. 1886-98†	6	4	..	3	7	9	6	5	5	3	7	9	13		1.4	3.5	2	2.4	2.7	1.4	1	0.8	0.6	0.4	1.2	1	2
Diphtheria.	Av. 22 yrs., 1877-98.	13	17	15	13	12	11	10	9	10	10	17	18	17	Rheumatism.	67	70	70	72	73	70	66	60	57	60	65	68	70
	Av. 10 yrs., 1889-98.	6	8	6	5	5	5	5	4	4	5	8	9	8		64	68	67	69	70	68	63	60	57	59	63	65	66
	1898	3	5	6	4	3	2	3	0.7	0.6	2	4	5	5		62	68	70	73	66	61	59	55	55	57	62	63	63
	1899	3	3	4	4	2	3	2	0	0.6	3	5	3	4		63	63	59	68	67	63	63	64	57	63	65	60	68
	In 1899 greater than av. 1877-1898	..	..	..	..	..	..	..	...	...	..	..	..	..		...	...	..	...	...	. .	...	4	=	3	=	...	..
	In 1899 less than av. 1877-1898	10	14	11	9	10	8	8	9	9.4	7	12	15	13		4	7	11	4	6	7	3	...	=	...	=	8	2
	In 1899 greater than av. 1886-1898†	..	..	..	..	..	..	..	...	...	..	..	..	..		...	...	..	...	...	...	=	4	=	4	2	...	2
	In 1899 less than av. 1886-1898†	3	5	2	1	3	2	3	4	3.4	2	3	6	4		1	5	8	1	3	5	=	...	=	...	...	5	..
Influenza.	Av. 22 yrs., 1877-98.	41	62	66	64	56	40	27	19	19	27	32	42	53	Scarlet fever.	13	17	16	16	16	14	12	10	9	10	12	14	14
	Av. 10 yrs., 1889-98.	45	71	74	72	62	44	27	19	19	26	32	44	60		9	12	10	10	11	10	9	7	6	7	10	11	11
	1898	45	66	67	69	65	50	32	20	20	27	31	48	63		5	7	5	3	5	5	3	5	4	3	5	8	8
	1899	42	88	91	77	57	33	20	14	15	17	24	35	47		8	12	14	11	11	7	5	5	4	6	6	8	6
	In 1899 greater than av. 1877-1898	1	26	25	13	1	..	..	...	...	..	..	..	..		...	...	..	...	...	...	...	...	...	...	...	...	..
	In 1899 less than av. 1877-1898	..	..	..	..	..	7	7	5	4	10	8	7	6		5	5	2	5	5	7	7	5	5	4	6	6	8
	In 1899 greater than av. 1886-1898†	..	17	17	5	..	..	..	...	...	..	..	..	..		...	=	4	1	=	...	...	...	...	...	...	...	..
	In 1899 less than av. 1886-1898†	3	..	..	..	5	11	7	5	4	9	8	9	13		1	=	..	...	=	3	4	2	2	1	4	3	5
Neuralgia.	Av. 20 yrs., 1879-98.	63	67	68	70	69	64	60	56	55	56	60	64	65	Tonsillitis.	47	58	58	57	53	46	38	32	32	35	44	53	57
	Av. 10 yrs., 1889-98.	59	65	66	68	66	60	56	53	52	53	57	60	61		46	56	56	54	52	46	37	33	33	34	43	51	55
	1898	54	66	65	67	58	53	46	39	46	46	54	59	60		40	50	54	48	46	38	32	28	29	33	40	47	50
	1899	56	58	58	57	60	57	53	50	47	54	56	58	61		42	53	49	49	50	41	33	30	27	34	40	49	56
	In 1899 greater than av. 1879-1898	..	..	..	..	..	..	..	...	...	..	..	..	..		...	...	..	...	...	...	...	...	...	...	...	...	..
	In 1899 less than av. 1879-1898	7	9	10	13	9	7	7	6	8	2	4	6	4		5	5	9	8	3	5	5	2	5	1	4	4	1
	In 1899 greater than av. 1886-1898†	..	..	..	..	..	..	..	...	...	1	..	..	=		...	...	..	...	...	...	...	...	...	=	...	...	1
	In 1899 less than av. 1886-1898†	3	7	8	11	6	3	3	3	5	..	1	2	=		4	3	7	5	2	5	4	3	6	=	3	2	..

*For neuralgia and tonsillitis an average for the 20 years, 1879-1898.

†This comparison is made because of change of plan of reports in May, 1885, as explained on a preceding page in this article.

The lines for 1899 in Exhibit VIII, relative to the eight diseases, are graphically represented in Diagrams 1, 2, 3 and 4 of this article.

DIAGRAM 3—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1899.



[PLATE 1064.]

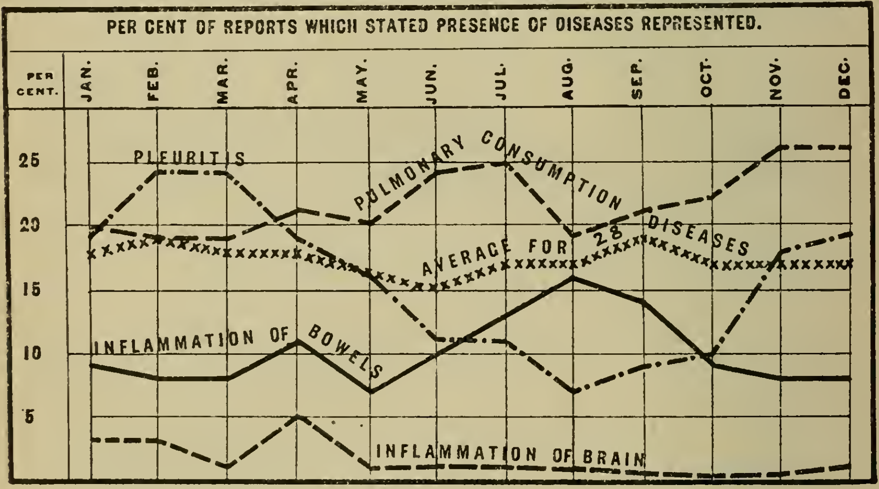
EXHIBIT IX.—SICKNESS FROM CONSUMPTION.—1895-99.—*By year and months for each of the 5 years, 1895-99, and an average for the 21 years, 1878-98,* also for the 10 years, 1889-98; stating on what per cent of the weekly reports received* CONSUMPTION *was reported present, and comparing the per cents for 1899 with the averages for corresponding months in those years.*

Years, etc.	Annual av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average 21 years, 1878-98.*....................	49	50	51	52	54	51	50	48	47	52	47	47	47
Average 10 years, 1889-98....................	35	36	36	37	40	37	35	35	34	34	33	33	33
1895..	29	33	31	33	34	29	30	29	28	25	25	24	24
1896..	23	22	24	22	21	26	24	22	25	25	22	22	21
1897..	20	22	20	23	21	22	22	23	22	18	16	14	13
1898..	20	14	16	17	22	22	22	24	20	19	19	22	20
1899..	22	20	19	19	21	20	24	25	19	21	22	26	26
In 1899 less than av. 1878-98..................	27	30	32	33	33	31	26	23	28	31	25	21	21
In 1899 less than av. 1889-98†.................	13	6	4	4	7	6	9	12	6	3	8	12	12

*As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded from the average line.

†This comparison is made because of change of plan of reports in May, 1885, as explained on a preceding page in this article.

DIAGRAM 4—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1899.



[PLATE 1065.]

Relations of diarrhea and other "warm-weather" diseases to meteorological conditions.[*]

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, cholera morbus, dysentery, measles, or whooping-cough, the average daily temperature, the average daily range of temperature, the absolute humidity of the atmosphere, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea (or of the other diseases named), these conditions were **less** than the average for the year.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, cholera morbus, dysentery, measles, or whooping-cough, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, and the monthly and average daily range of the barometer were **less** than the average for the year; and that in months when **less** than the average per cent of reports stated the presence of diarrhea (or of the other diseases named), these conditions were **greater** than the average for the year.

Explanations of propositions 1 and 2 are given on a preceding page, under the heading, "Climate and Sickness."

A summary relative to the foregoing propositions, is presented in Exhibit XII, near the close of this article.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to proposition 1, it is true, also, that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea, cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, whooping-cough, cholera morbus and dysentery; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea (and of the other diseases named) was **less** than the average.

On what per cent of the weekly reports received, by months in the years 1877-99, the ten foregoing diseases were reported present, is stated in Exhibit X.

The lines for 1899, relative to the ten diseases, are graphically represented in Diagrams 1, 3 and 5 in this article.

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[*] A comparison of meteorological conditions in 1899, with the average for series of years, is given in Exhibit V of this article.

EXHIBIT X.—*By year and months for 1899 and for the preceding year, and averages for the 22 years, 1877-98, also for the 10 years, 1889-98,—stating on what per cent of the weekly reports received* DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES, WHOOPING-COUGH, CHOLERA MORBUS AND DYSENTERY *were reported present, and comparing the per cents for 1899, with the averages for corresponding months in the years specified.*

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Diarrhea.	Av. 22 yrs., 1877-98.	44	26	26	28	29	32	41	66	80	76	53	33	26	Cholera infantum.	12	3	1	2	2	3	9	27	41	33	12	3	2
	Av. 10 yrs., 1889-98.	41	25	24	26	26	28	36	58	74	71	52	29	24		10	1	1	0.9	1	3	7	21	35	31	12	2	1
	1898.	36	22	22	20	17	20	29	48	65	67	49	28	25		8	1	0.5	0.7	1	1	6	18	28	26	12	0.6	0.3
	1899.	37	19	17	22	27	23	37	53	68	72	47	31	26		8	1	1	0.4	2	0.7	6	17	31	24	8	3	0.6
	In 1899 greater than av. 1877-1898.	..	..	...	..	..	..	..	..	..	..	...	..	=		..	....	=	...	=	..	...	..	..	..	..	=	...
	In 1899 less than av. 1877-1898	7	7	9	6	2	9	4	13	12	4	6	2	—		4	2	—	1.6	=	2.3	3	10	10	9	4	—	1.4
	In 1899 greater than av. 1886-1898*	..	..	...	..	1	..	1	..	..	1	...	2	2		..	—	=	..	1	...	...	..	..	..	..	1	...
	In 1899 less than av. 1886-1898*	4	6	7	4	..	5	..	5	6	..	5	..	..		2	=	=	0.5	..	2.3	1	4	4	7	4	...	0.4
Intermittent fever.	Av. 22 yrs., 1877-98.	49	40	40	43	49	52	54	56	57	56	54	48	41	Remittent fever.	34	28	28	29	31	32	34	36	41	43	42	35	30
	Av. 10 yrs., 1889-98.	27	21	20	22	27	27	28	31	34	33	31	27	22		20	17	16	16	17	18	19	22	25	27	26	22	19
	1898.	19	12	11	14	17	19	17	20	26	26	25	22	12		13	9	7	8	11	11	12	15	18	21	18	13	13
	1899.	17	13	12	11	19	19	19	23	21	18	21	17	11		12	7	10	8	11	11	11	13	14	17	16	12	10
	In 1899 greater than av. 1877-1898.	..	..	...	..	..	..	..	..	..	..	...	..	..		..	....	...	...	...	...	...	..	..	..	..	...	...
	In 1899 less than av. 1877-1898	32	27	28	32	30	33	35	33	36	38	33	31	30		22	21	18	21	20	21	23	23	27	26	26	23	20
	In 1899 greater than av. 1886-1898*	..	..	...	..	..	..	..	..	..	..	...	..	..		..	....	...	...	...	...	...	..	..	..	..	...	...
	In 1899 less than av. 1886-1898*	10	8	8	11	8	8	9	8	13	15	10	10	11		8	10	6	8	6	7	8	9	11	10	10	10	9
Typhoid fever.	Av. 22 yrs., 1877-98.	11	9	7	5	4	4	5	7	13	19	21	18	12	Typho-malarial fever.	14	11	9	8	8	7	8	10	17	25	27	20	13
	Av. 10 yrs., 1889-98.	10	7	5	4	3	3	5	7	14	18	21	16	10		5	4	2	3	3	3	2	4	8	10	11	6	4
	1898.	8	6	5	6	5	2	3	6	10	14	15	13	7		2	2	0.8	2	0.6	1	0.5	2	2	6	6	4	4
	1899.	9	3	2	3	3	4	7	7	12	14	21	18	10		1	0.8	0.5	0	0	0	1	3	2	2	3	1	1
	In 1899 greater than av. 1877-1898.	..	..	...	..	..	=	2	=	..	..	=	=	..		..	....	. .	...	...	...	...	..	..	..	..	...	...
	In 1899 less than av. 1877-1898	2	6	5	2	1	=	..	=	1	5	=	=	2		13	10.2	8.5	8	8	7	7	7	15	23	24	19	12
	In 1899 greater than av. 1886-1898*	..	..	...	..	=	1	2	=	..	..	—	2	—		..	....	...	...	...	...	...	..	..	..	..	...	...
	In 1899 less than av. 1886-1898*	1	4	3	1	=	..	..	=	2	4	=	..	=		4	3.2	1.5	3	3	3	1	1	6	8	8	5	3
Measles.	Av. 22 yrs., 1877-98.	11	9	12	15	19	22	18	11	5	3	3	5	6	Whooping-cough.	14	14	14	14	13	14	14	17	16	15	13	13	13
	Av. 10 yrs., 1889-98.	8	6	9	12	15	16	15	8	4	2	2	3	4		9	8	8	9	10	10	9	11	11	9	7	8	8
	1898.	7	10	6	11	17	10	14	8	4	2	0.5	0	2		5	4	2	5	5	6	4	5	6	4	2	7	7
	1899.	6	2	3	7	11	14	10	9	4	3	2	3	6		4	4	2	2	1	2	3	4	4	5	5	5	8
	In 1899 greater than av. 1877-1898.	..	..	...	..	..	..	..	..	..	=	...	..	=		..	....	...	..	...	...	...	..	..	..	..	...	...
	In 1899 less than av. 1877-1898	5	7	9	8	8	8	8	2	1	=	1	2	=		10	10	12	12	12	12	11	13	12	10	8	8	5
	In 1899 greater than av. 1886-1898*	..	..	...	..	..	..	..	1	=	1	=	=	2		..	....	...	...	...	...	...	..	..	..	..	...	=
	In 1899 less than av. 1886-1898*	2	4	6	5	4	2	5	..	=	..	=	=	..		5	4	6	7	9	8	6	7	7	4	2	3	=
Cholera morbus.	Av. 22 yrs., 1877-98.	16	3	4	4	5	7	16	38	50	36	14	6	4	Dysentery.	17	6	6	7	7	7	12	26	46	43	23	10	6
	Av. 10 yrs., 1889-98.	14	3	3	3	4	6	12	29	42	34	14	5	3		14	6	5	5	5	6	9	19	37	37	22	8	5
	1898.	12	2	2	2	2	4	8	22	36	31	16	3	2		12	4	3	6	2	2	6	16	33	32	21	5	3
	1899.	10	1	0.5	1	3	4	10	25	32	28	11	4	2		13	3	2	3	3	4	8	23	39	43	18	6	4
	In 1899 greater than av. 1877-1898.	..	..	...	..	..	..	..	..	..	..	...	..	..		..	....	...	...	...	...	...	..	..	=	..	...	...
	In 1899 less than av. 1877-1898	6	2	3.5	3	2	3	6	13	18	8	3	2	2		4	3	4	4	4	3	4	3	7	=	5	4	2
	In 1899 greater than av. 1886-1898*	..	..	...	..	..	..	..	..	..	..	...	..	..		..	....	...	...	...	...	...	4	2	6	..	...	...
	In 1899 less than av. 1886-1898*	4	2	2.5	2	1	2	2	4	10	6	3	1	1		1	3	3	2	2	2	1	..	..	..	4	2	1

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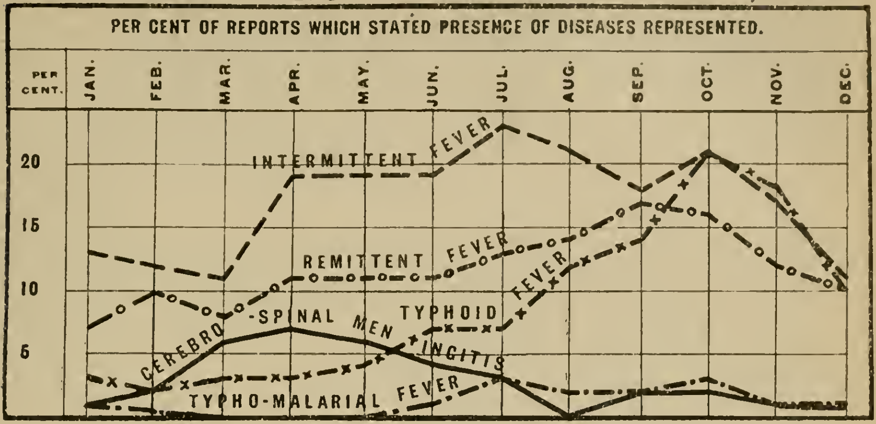
*This comparison is made because of change of plan of reports in May, 1885, as explained on a preceding page in this article.

DIAGRAM 5—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1899.



[PLATE 1066.]

Total sickness—average disease.—"Average disease" is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is shown on the third page of this article. Twenty-eight diseases are printed on the cards. In 1899 there were 5,126 of these card reports received. On some of the cards only one or two diseases were reported present and on others more. Had each disease (printed on this card, and only the twenty-eight thus named) been reported present on every card received at this office, there would have been 143,528 reports of diseases present. (This is the product of 5,126 reports received multiplied by twenty-eight, the number of diseases printed on the cards, or 100 per cent of the possible disease reports.) There were actually present on the cards received at this office only 24,700 disease reports, which 24,700÷143,528 of the possible disease reports that might have been present, is about 17 per cent. This 17 per cent represents the actual sickness in the State from the tabulated diseases reported present, or in other words the sickness from "average disease." This is shown, by months in Diagram 4, on a preceding page.

Exhibit XIII serves to indicate the probable actual sickness in the State from the tabulated diseases in 1898-99. It compares the sickness in 1899 by months with the sickness by months in each of the twenty-two years, 1877-1898. It also compares the sickness by months in 1899, with the sickness, by months, in each of the ten years, 1889-1898.

By Exhibit XIII, it will be seen that the sickness reported in 1899. was, for the year, and for each month of the year, considerably less than the average reported for the twenty-two years. 1877-1898, and less than the average for the ten years. 1889-1898.

COLD-WEATHER DISEASES.

EXHIBIT XI.—*Summary relative to propositions on preceding pages and in Exhibit X, concerning relations by months, in 1899, between greater or less than usual prevalence of diseases named, and certain given coincident climatic conditions.*

Diseases.	Months (inclusive) in which diseases named were more than usually prevalent in 1899.	Months (inclusive) in which diseases named were less than usually prevalent in 1899.	For the 12 months of the year 1899. Number of months in which propositions hold true.*										
			That in months when diseases named were more than usually prevalent the conditions named below were greater than usual, and in months when less than usually prevalent these conditions were less than usual.†							That in mos. when diseases named were more than usually prevalent the conditions named below were lower than usual, and in months when the diseases were less than usually prevalent these conditions were higher than usual.†			
			Relative humidity.	Average per cent of cloudiness.	Ozone.		Veloc ty of wind.	Atmospheric pressure. Range.		Average temperature.	Average daily range of temp.†	Average daily atmospheric pressure.†	Absolute humidity.
					Day.	Night.		Monthly.	Av. daily.				
Bronchitis	Jan.-May, Nov., Dec.	June-Oct.	9	10	10	9	10	10	9	10	10	6	11
Pneumonia	Jan.-April	May-Dec	8	9	11	10	11	9	10	9	9	7	10
Membran. croup.	Feb., Oct.-Dec.	Jan., Mar.-Sept.	10	9	5	4	8	9	8	9	9	7	8
Diphtheria	Feb., Mar., Oct., Dec.	Jan., Apr.-Sept., Nov.	10	9	7	6	10	9	10	9	9	9	8
Tonsillitis	Jan.-Apr., Nov., Dec.	May-Oct	10	11	9	8	11	11	10	11	11	7	12
Influenza	Jan.-April, Dec.	May-Nov	9	10	10	9	12	10	11	10	10	8	11
Scarlet fever	Jan.-April	May-Dec	8	9	11	10	11	9	10	9	9	7	10
Rheumatism	Mar., Apr., July, Oct., Dec.	Jan., Feb., May, June, August, Sept., Nov.	7	6	6	6	9	6	7	6	6	8	7
Neuralgia	Jan.-May, Nov., Dec.	June-Oct.	9	10	10	9	10	10	9	10	10	6	11
Consumption, pul.	June, July, Nov., Dec.	Jan.-May, Aug.-Oct.	6	7	3	4	7	7	6	7	7	7	6
Pleuritis	Jan.-Apr., Nov., Dec.	May-Oct	10	11	9	8	11	11	10	11	11	7	12
Average disease.	Jan.-Apr., Sept.	May.-Aug., Oct.-Dec.	7	8	10	9	10	8	9	8	8	6	9

*The figures in each of these eleven columns show for how many months out of the twelve months in 1899, the proposition named over the column holds true; thus, concerning bronchitis, the proposition relative to average daily range of temperature held true in ten months out of the twelve; that relative to average temperature, in ten out of twelve, etc.

†The statements relative to the average daily range of temperature and the average daily pressure of the atmosphere were taken from proposition 1 and inserted in proposition 2 in the statistical study of sickness in Michigan in 1893, annual report for 1894. These propositions are printed on preceding pages of this report, under the heading "Climate and Sickness."

On this subject Exhibits A and B, on preceding pages, and the accompanying remarks, may be studied in connection with the exhibits and remarks in this part of this article. In Exhibit A, the order of prevalence of each disease, including the "average disease," is shown as it appears after taking account of the order or prevalence of each disease in the places where it was present, and also the per cent of all reports received on which that disease was reported.

WARM-WEATHER DISEASES.

EXHIBIT XII.—*Summary relative to propositions on preceding pages concerning relations, by months in 1899, between greater or less than usual prevalence of diseases named, and certain given coincident climatic conditions.*

<table>
<tr><th rowspan="5">Diseases.</th><th rowspan="5">Months (inclusive) in which diseases named were more than usually prevalent in 1899.</th><th rowspan="5">Months (inclusive) in which diseases named were less than usually prevalent in 1899.</th><th colspan="11">For the 12 months of the year 1899. Number of months in which propositions hold true.*</th></tr>
<tr><th colspan="4">That in months when diseases named were more prevalent than usual, the conditions named below were higher than usual; and in months when the diseases were less prevalent than usual, these conditions were lower than usual.</th><th colspan="7">That in months when diseases named were more prevalent than usual, the conditions named below were less than usual; and in months when the diseases were less prevalent than usual, these conditions were greater than usual.</th></tr>
<tr><th rowspan="3">Average temperature.</th><th rowspan="3">Av. daily range of temp.</th><th rowspan="3">Absolute humidity.</th><th rowspan="3">Av. daily atmospheric pressure.</th><th colspan="2">Atmospheric pressure.</th><th rowspan="3">Relative humidity.</th><th rowspan="3">Av. per cent of cloudiness.</th><th colspan="2">Ozone.</th><th rowspan="3">Velocity of wind.</th></tr>
<tr><th colspan="2">Range.</th><th rowspan="2">Day.</th><th rowspan="2">Night.</th></tr>
<tr><th>Monthly.</th><th>Av. daily.</th></tr>
<tr><td>Diarrhea...........</td><td>July-Oct........</td><td>Jan.-June, Nov., Dec.</td><td>9</td><td>9</td><td>10</td><td>5</td><td>9</td><td>8</td><td>8</td><td>9</td><td>9</td><td>10</td><td>9</td></tr>
<tr><td>Cholera infantum..</td><td>July-Sept.......</td><td>Jan.-June, Oct.-Dec.</td><td>8</td><td>8</td><td>9</td><td>4</td><td>8</td><td>7</td><td>9</td><td>8</td><td>8</td><td>9</td><td>9</td></tr>
<tr><td>Intermittent fever.</td><td>Apr.-Oct........</td><td>Jan.-Mar., Nov., Dec.</td><td>12</td><td>12</td><td>11</td><td>8</td><td>12</td><td>11</td><td>11</td><td>12</td><td>8</td><td>7</td><td>11</td></tr>
<tr><td>Remittent fever...</td><td>July-Oct........</td><td>Jan.-June, Nov., Dec.</td><td>9</td><td>9</td><td>10</td><td>5</td><td>9</td><td>8</td><td>8</td><td>9</td><td>9</td><td>10</td><td>9</td></tr>
<tr><td>Typhoid fev. (ent.).</td><td>Aug.-Dec.......</td><td>Jan.-July........</td><td>6</td><td>6</td><td>7</td><td>6</td><td>7</td><td>7</td><td>5</td><td>6</td><td>10</td><td>11</td><td>8</td></tr>
<tr><td>Typho-mal. fever..</td><td>July-Oct........</td><td>Jan.-June, Nov., Dec.</td><td>9</td><td>9</td><td>10</td><td>5</td><td>9</td><td>8</td><td>8</td><td>9</td><td>9</td><td>10</td><td>9</td></tr>
<tr><td>Measles ....</td><td>Mar.-July.......</td><td>Jan., Feb., Aug.-Dec.</td><td>8</td><td>8</td><td>7</td><td>6</td><td>8</td><td>7</td><td>9</td><td>8</td><td>4</td><td>3</td><td>7</td></tr>
<tr><td>Whooping-cough ..</td><td>Sept.-Dec.......</td><td>Jan.-Aug.......</td><td>5</td><td>5</td><td>6</td><td>7</td><td>5</td><td>6</td><td>4</td><td>5</td><td>9</td><td>10</td><td>7</td></tr>
<tr><td>Cholera morbus....</td><td>July-Oct........</td><td>Jan.-June, Nov., Dec.</td><td>9</td><td>9</td><td>10</td><td>5</td><td>9</td><td>8</td><td>8</td><td>9</td><td>9</td><td>10</td><td>9</td></tr>
<tr><td>Dysentery.........</td><td>July-Oct........</td><td>Jan.-June, Nov., Dec.</td><td>9</td><td>9</td><td>10</td><td>5</td><td>9</td><td>8</td><td>8</td><td>9</td><td>9</td><td>10</td><td>9</td></tr>
</table>

*The figures in each of these eleven columns show for how many months out of the twelve months in 1899 the proposition named over the column holds true; thus, concerning diarrhea, the proposition relative to average daily range of temperature held true in nine months out of the twelve; that relative to absolute humidity ten months out of the twelve, etc.

EXHIBIT XIII.—SICKNESS FROM AVERAGE DISEASE, 1898-99.—*By year and months for each of the years, 1898-99, stating on an average for such of the 28 diseases tabulated as were reported present, what per cent of the weekly reports received stated presence of the diseases; and comparing the average per cents for months in 1899 with the averages for corresponding months in the 22 years, 1877-98, and in the 10 years, 1889-98.**

Years, etc.	Annual av.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average 22 years, 1877-98	25	26	26	26	26	24	23	24	27	27	26	25	25
Average 10 years, 1889-98	21	22	21	22	22	20	19	19	22	22	21	20	20
1898	17	17	18	17	18	15	14	15	18	18	18	17	18
1899	17	18	19	18	18	16	15	17	17	19	17	17	17
In 1899 less than average 1877-98	8	8	7	8	8	8	8	7	10	8	9	8	8
In 1899 less than average 1889-98*	4	4	2	4	4	4	4	2	5	3	4	3	3

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*This last comparison is made because of the change in the plan of making the reports. which occurred in May, 1885, as explained on a preceding page in this article.

COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1899.

(COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper continues a subject treated for the preceding year on pages 105-218 of the Report of the State Board of Health for the year 1899, and for former years in previous reports.

Whenever information is received at this office that diphtheria, scarlet fever, typhoid fever, consumption, meningitis, smallpox, measles, German measles (rötheln), whooping-cough, rabies or glanders, is present, or has recently been present in any locality in Michigan, a letter is sent to the health officer of the township, city or village in which the disease is reported to be present (if the name of the health officer has been reported to this office; if not, to the president of the board of health), mentioning the reported existence of the disease within his jurisdiction, indicating his duties and powers and the proper measures to be taken in restricting the disease, transmitting documents of instruction relative to the prevention and restriction of the disease, for distribution among the neighbors of families in which the disease is present,* and asking for a report of the methods employed for the restriction of the disease, and the results of efforts for suppressing it, also the number of cases and deaths in each outbreak. With this letter in each instance, except in case of rabies and glanders, there was sent a blank form (L), or (S for consumption), for the notice of the first case of a dangerous communicable disease, and a blank form (M) for weekly reports during the continuance of the disease. After the outbreak was over, there was sent a blank form (K), (O), (Q), (R) or (U) for a special final report, for the purpose of learning what was done for the restriction and prevention of the disease, by way of isolation and disinfection; also whether or not disinfection was by fumes of burning sulphur or by formaldehyde, and whether either is efficient as a disinfectant, and what quantity of each is required to accomplish disinfection. The blank (K) is for diphtheria, scarlet fever, measles, whooping-cough and rötheln; the blank (O) is for typhoid fever; the blank (Q) for smallpox; the blank (R) for consumption and the blank (U) for meningitis. These blanks for special final reports have been especially prepared, and differ from each other, therefore should be used only for the disease for which each is prepared.

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*It is believed that these documents distributed in this manner are doing great good; for the neighbors of the sick are sufficiently alarmed to read the documents, and are thus led to co-operate in stamping out the disease. Some evidence of the value of this work may be seen further on, in the several articles to which this is an introduction, in tables which show the estimated number of outbreaks of, and cases of sickness from communicable diseases prevented, and lives saved by isolation and disinfection.

In the report of this Board for the year 1895 (pp. 153-174) in the introduction to the articles on the dangerous communicable diseases, are printed tables and diagrams which show the results of restrictive measures recommended by this Board.

14

TABLE 1.—*Number of all places* in Michigan at which communicable diseases were reported present, also the number of new places† at which each disease was reported present each week in 1899.*

Weeks ending Saturday—		Diphtheria.		Scarlet fever.		Typhoid fever.		Measles.		Whooping-cough.		Consumption.		Small-pox.	
		Places.*	New places.	Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.	Places.	New places.
January	7..	29	9	54	13	38	13	19	7	18	8	145	18	1	0
	14..	22	7	51	17	25	2	21	6	19	2	130	10	2	0
	21..	22	8	50	10	29	7	20	6	15	4	94	7	2	1
	28..	26	8	50	21	25	8	20	4	13	1	100	13	1	0
February	4..	25	8	47	6	28	4	17	4	17	1	100	9	2	0
	11..	20	4	46	13	17	9	21	5	13	2	96	6	2	0
	18..	23	9	48	8	17	2	31	12	11	1	100	4	0	0
	25..	22	5	47	14	20	4	36	10	12	2	103	9	1	0
March	4..	25	12	52	13	20	6	31	9	11	3	111	10	1	1
	11..	18	5	52	23	21	8	34	9	11	5	115	8	6	2
	18..	17	3	56	10	23	5	38	16	13	1	119	8	6	3
	25..	22	6	50	17	29	13	39	13	12	3	126	17	5	1
April	1..	22	9	41	15	22	6	44	14	10	2	130	10	5	1
	8..	25	4	38	4	21	5	47	14	12	5	130	4	5	0
	15..	17	9	42	17	16	9	58	21	12	0	133	7	5	0
	22..	13	6	43	11	16	2	63	17	13	2	137	8	3	0
	29..	......	4	45	9	22	3	74	27	19	4	150	10	2	1
May	6..	11	5	35	11	20	7	68	20	11	4	151	14	0	0
	13..	16	7	48	13	16	2	86	25	15	3	150	4	0	0
	20..	13	5	37	17	15	7	59	20	14	5	161	11	0	1
	27..	12	3	37	9	19	5	45	9	13	3	164	7	0	0
June	3..	13	6	32	11	18	6	54	16	18	0	169	8	0	0
	10..	17	3	40	12	15	6	53	15	15	3	175	4	1	1
	17..	16	8	35	10	22	2	55	14	16	6	185	10	2	1
	24..	13	1	30	10	35	10	57	9	12	2	189	16	1	1
July	1..	14	7	40	13	34	13	38	14	13	4	191	10	0	0
	8..	13	4	31	7	35	16	48	10	18	5	182	9	0	0
	15..	14	4	33	8	37	9	44	13	18	6	182	6	1	0
	22..	13	9	32	14	41	15	33	10	17	4	184	8	0	0
	29..	15	3	29	9	36	9	36	10	19	4	189	7	0	0
August	5..	11	8	32	11	50	15	22	3	20	5	188	9	1	0
	12..	11	3	23	6	54	17	21	2	16	2	181	5	0	1
	19..	14	5	32	10	81	36	18	4	17	5	190	7	1	0
	26..	19	5	35	13	74	23	16	4	19	5	193	13	1	0
September	2..	13	4	35	6	76	25	15	9	19	1	200	10	0	0
	9..	19	11	36	11	86	20	13	3	15	5	199	7	1	0
	16..	21	2	36	12	94	31	9	2	14	0	203	8	2	1
	23..	20	10	44	13	98	20	11	2	16	2	203	18	2	0
	30..	19	3	57	23	106	26	9	0	18	5	205	11	1	0
October	7..	28	10	54	12	128	39	17	3	17	2	204	7	2	1
	14..	29	13	55	14	130	31	11	3	17	2	205	7	4	0
	21..	27	9	63	20	123	36	15	3	17	3	207	9	5	2
	28..	29	11	73	16	121	28	22	10	17	5	205	5	8	4
November	4..	33	11	73	20	104	15	20	7	17	1	209	5	10	3
	11..	39	14	69	13	104	25	29	9	18	1	205	4	10	1
	18..	34	11	70	15	95	23	28	10	25	3	207	6	7	1
	25..	41	12	65	16	77	19	32	7	21	2	206	7	6	6
December	2..	28	4	70	12	75	11	36	8	25	7	216	8	7	1
	9..	28	11	77	22	65	10	49	16	25	4	219	13	6	2
	16..	26	8	77	18	65	14	43	12	20	2	215	11	4	1
	23..	30	14	74	16	53	13	41	10	21	4	212	8	3	3
	30..	28	9	64	11	40	12	45	13	16	2	212	5	5	0
Average number of places per week..		21	7	48	13	51	14	35	10	16	3	169	9	3	7

*The number of "Places" are copied from the weekly bulletins "Health in Michigan" issued every Wednesday, and include all places at which the several diseases were reported present up to and including Saturday of the calendar week for which each bulletin is issued. "New places" are included in these numbers.

The numbers in the first column, "Places," are compiled from the data in card-reports for the sickness statistics, the outbreak reports of communicable diseases, and the weekly reports of communicable diseases.

†The "New places," are those from which the specified diseases were first reported during the calendar week specified in each bulletin. They are compiled from the same sources as are the numbers in the first column of this table and from newspaper reports. Neither of the columns of this table contain *all* the places at which, later, by the "final" and "annual" reports, the diseases were found to have been present.

The information contained in the reports upon the above-mentioned blanks and those supplied to health officers of townships, cities and villages, for their annual reports, when returned to this office by the health officers of localities where dangerous communicable diseases have existed, together with other correspondence in regard to outbreaks of such diseases, are the bases on which the various statements made in this article are founded.

It is probable that every case of smallpox is reported to the Secretary of the State Board of Health; but that cannot yet be said of any other of the diseases in Table 1. Named in the order of most complete reports, probably these communicable diseases would be arranged as follows: Smallpox, scarlet fever, diphtheria, typhoid fever, measles, consumption.

Some of the purposes of this compilation.—The objects in having the data contained in the various reports received at the office of the secretary compiled, tabulated and published are: First, that facts relative to the ways whereby dangerous communicable diseases are spread in Michigan, and how they are sometimes restricted, and other useful facts, may be submitted to the people of the State, knowledge of which, it is hoped, will enable them to avoid or combat such diseases; and second, by the collation of such data to aid in the progress of sanitary science, especially in as far as it bears on the study of the cause and prevention of dangerous communicable diseases in Michigan.

Persistent efforts of this Board have been directed toward impressing the people of the State with the necessity of adopting restrictive measures,—isolation and disinfection, in outbreaks of communicable diseases.

Definition of the term "outbreak" as used in this article.—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction), died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area.

ABSTRACTS FROM THE QUARTERLY REPORTS OF WORK IN THE OFFICE OF THE SECRETARY, DURING THE YEAR 1899.

Summary relative to the year 1899.—The number of reports of outbreaks of dangerous communicable diseases in Michigan, received from all sources and filed, and the corresponding number concerning which action was taken by this office, during the year 1899, are as follows: For diphtheria (including croup) 445; for scarlet fever 704; for typhoid and typho-malarial fever 946; for measles 560; for whooping-cough 268;

for smallpox 34; for consumption 1,752, and for meningitis 597. Total for the eight diseases 5,306.

The number of communications relative to dangerous communicable diseases, received and placed on file during the year, was 18,846.

Relative to dangerous communicable diseases, letters, written cards, and demands for weekly and final reports on cards or in the form of the circular letter, were sent out during the year, to the number of 19,071.

The final reports of outbreaks received and filed during the year 1899, were: For diphtheria 355; for scarlet fever 569; for typhoid and typho-malarial fever 661; for measles 433; for whooping-cough 150; for smallpox 20; for consumption 1,918 and for meningitis 377. Total for the eight diseases 4,483.

TABLE 2.—YEAR 1899.—*Exhibiting the number of outbreaks of diphtheria, scarlet fever, typhoid fever, measles, whooping-cough, smallpox, consumption, and meningitis, from January 1 to December 31, 1899, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, first information concerning which was received through the newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of reports which were denied by the health officer; and the per cent relative to which no reply was received from the health officer.*

Diseases.	Reports from *all* sources, January 1 to December 31, 1899.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria (includes croup)................	* 445	2	22	45	33
Scarlet fever................................	* 704	3	30	22	48
Typhoid fever (includes typho-malarial)...	* 946	5	49	33	18
Measles..	* 560	5	46	8	46
Whooping-cough..............................	* 268	5	62	23	15
Smallpox.......................................	* 34	6	100	0	0
Consumption..................................	* 1,752	3	49	12	39
Meningitis.....................................	* 597	1	34	33	33
Averages for the eight diseases........................		3	46	21	33

*The numbers of outbreaks given in this table do not necessarily agree with the numbers given in tables in special articles in this annual report, for the reason that all alleged outbreaks, of which information was obtained from the newspapers and other sources are included in this table. If the health officers denied that such outbreaks occurred, or if they make no response to the letters sent from this office, relative to newspaper reports, such alleged outbreaks are not included in the final compilation of that disease.

The registration and return of deaths in Michigan, to the State Department, has resulted in giving this office, during the year 1899, the first information of the occurrence of 78 deaths from diphtheria and croup; 31 deaths from scarlet fever; 258 deaths from typhoid and typho-malarial fever; 39 deaths from measles; 105 deaths from whooping-cough; 1,293 deaths from consumption and 489 deaths from meningitis. A total for the seven diseases of 2,293.

During the year 1899, the local columns of 8,326 newspapers have been looked over for the reports of the occurrence of communicable diseases. (This work is done by the clerk who acts as messenger and janitor, in the intervals of his performance of other duties.) This has resulted in giving this office first information of the alleged occurrence of 9 outbreaks of diphtheria; 23 outbreaks of scarlet fever; 49 outbreaks of typhoid and typho-malarial fever; 26 outbreaks of measles; 13 outbreaks of whooping-cough; 2 outbreaks of smallpox; 49 cases of consumption and 6 cases of meningitis. To what extent the reports of these alleged outbreaks were verified, is shown in the accompanying table.

For the purpose of facilitating the proper action for the restriction of "diseases dangerous to the public health" and to make it possible to compile the important "contagious disease statistics," a record is kept of facts concerning every outbreak of a "disease dangerous to the public health," upon which action is taken by this office, and also of every important communication relating thereto received or sent out. This required over 37,000 entries to be made in the "Record Books," one of which books is kept for each dangerous communicable disease. An increase of over 6,000 entries over the preceding year, 1898, and an increase of over 17,000 entries over the year 1897.

During the year, 1899, compared with the year, 1898, action was taken on outbreaks of dangerous communicable diseases as follows: On diphtheria 55 outbreaks less; on scarlet fever 294 outbreaks more; on typhoid and typho-malarial fever 126 outbreaks more; on measles 83 outbreaks more; on whooping-cough 42 outbreaks less; on smallpox 27 outbreaks more and on consumption 117 cases less, than in 1898. No comparison can be made relative to meningitis as active work was not commenced upon that disease until the second quarter of 1899, since which time action has been taken on 597 cases. Not including meningitis, action has been taken upon 316 outbreaks more in 1899 than in 1898. Including meningitis 913 outbreaks more were acted upon in 1899 than in 1898.

DIPHTHERIA IN MICHIGAN—YEAR ENDING DECEMBER 31, 1899.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health 366 outbreaks of diphtheria in 303 localities in Michigan, which resulted in 2,154 cases and 435 deaths.

The average numbers of cases of sickness and deaths per outbreak were, cases, 5.89, deaths, 1.19. The fatality, i. e., the cases which proved fatal, was 20.2 per 100 cases.

In 1899 there were 203 cases and 42 deaths less reported diphtheria in Michigan than in 1898; and 1,638 cases and 403 deaths less than the average reported cases and deaths for the fifteen years 1884-1898.

The marked decrease in sickness and death from diphtheria in Michigan in 1899, seems to be a continuation of the decrease recorded as having begun in 1898. Possibly the causes to which the 1898 decrease is attributed (Annual Report State Board of Health for 1899, pp. 119-120) are responsible for the continued decrease of 1899.

Whatever the cause or causes may have been which contributed to the marked decrease in prevalence of diphtheria in the State during the last two years, the statistical data show that in 1899, as compared with 1898, there was a reduction of over 14 per cent in the reported number of infected localities, nearly 17 per cent in the number of outbreaks, and about 8 per cent in the numbers of cases and deaths from this disease; and that in the same year (1899), as compared with the average for the fifteen years 1884-98, there was a reduction of over 19 per cent in the reported numbers of localities and outbreaks, 43 per cent in the number of reported cases, and 48 per cent in the number of reported deaths.

In 1899 efforts have been made to collect data bearing on the probability of the use of antitoxin as an immunizing agent being a factor in the decrease of diphtheria. As a result of these efforts, it is found that relative to four per cent of the reported outbreaks of diphtheria in 1899, health officers stated that antitoxin had been used either as a preventive or remedial agent. It is also found that in those outbreaks in which antitoxin was used the average cases and deaths per outbreak were,—cases 7.7, deaths 0.8; whereas in outbreaks where this agent was not used, the average cases were 5.8, and deaths 1.2, per outbreak. The fatality (deaths per 100 cases) in outbreaks where antitoxin was used was ten per cent; and in outbreaks where antitoxin was not used it was twenty-one per cent.

A. Van Der Veen, M. D., Acting Health Officer of Grand Haven City, reporting relative to an outbreak of diphtheria in his jurisdiction, in which there occurred sixteen cases with no deaths, and in which antitoxin was used in the treatment of the cases, writes as follows of the beneficial results of said treatment:—

> "The antitoxin treatment breaks up all the acute symptoms in twenty-four hours—clears up all exudate in fauces, no matter how extensive, or how ulcerative, in three or four days—and the patient is strong in convalescence—needs no medication except a mild antiseptic gargle to wash away the necrotic tissues."

TABLE 1.—*Number of cases and deaths reported from diphtheria per 10,000 persons living in each county in Michigan during the year 1899. (Compiled from reports of health officers, clerks, etc.)*

Counties.	Estimated population for 1899.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population for 1899.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State	2,426,331	2,154	435	8.88	1.79	Keweenaw	2,829	......	......	....	......
Alcona	5,429	......	......	....	......	Lake	5,137	1	1	1.95	1.95
Alger	1,569	2	......	12.75	......	Lapeer	28,460	10	......	3.51	......
Allegan	39,474	16	4	4.05	1.01	Leelanau	11,310	6	4	5.30	3.54
Alpena	20,387	34	3	16.68	1.47	Lenawee	48,657	33	6	6.78	1.23
Antrim	14,943	12	5	8.03	3.35	Livingston	19,911	9	1	4.52	0.50
Arenac	8,518	7	2	8.22	2.35	Luce	2,214	......	......	....	......
Baraga	5,727	......	......	....	......	Mackinac	6,496	......	......	....	......
Barry	23,594	16	1	6.78	0.42	Macomb	34,105	33	11	9.68	3.23
Bay	67,419	73	16	10.83	2.37	Manistee	28,469	5	2	1.76	0.70
Benzie	11,596	......	......	....	......	Marquette	40,418	37	8	9.15	1.98
Berrien	51,073	18	6	3.52	1.17	Mason	20,968	6	1	2.86	0.48
Branch	25,477	2	1	0.79	0.39	Mecosta	22,019	12	4	5.45	1.82
Calhoun	52,436	19	7	3.62	1.33	Menominee	25,248	13	1	5.15	0.40
Cass	21,455	8	2	3.73	0.93	Midland	16,419	20	4	12.18	2.44
Charlevoix	12,637	1	......	0.79	......	Missaukee	9,339	......	......	....	......
Cheboygan	16,293	2	1	1.23	0.61	Monroe	34,236	57	15	16.65	4.38
Chippewa	19,451	1	......	0.51	......	Montcalm	36,059	13	1	3.61	0.28
Clare	8,499	......	......	....	......	Montmorency	3,627	3	......	8.27	......
Clinton	25,953	2	......	0.77	......	Muskegon	33,963	11	3	3.24	0.88
Crawford	2,395	......	......	....	......	Newaygo	17,436	3	......	1.72	......
Delta	24,177	......	......	....	......	Oakland	44,465	21	3	4.72	0.67
Dickinson	15,635	21	......	13.43	......	Oceana	17,725	2	1	1.13	0.56
Eaton	33,273	5	......	1.50	......	Ogemaw	5,707	5	1	8.76	1.75
Emmet	13,045	......	......	....	......	Ontonagon	10,769	1	......	0.93	......
Genesee	41,957	29	3	6.91	0.72	Osceola	18,781	12	8	6.39	4.26
Gladwin	5,765	......	......	....	......	Oscoda	1,683	......	......	....	......
Gogebic	15,229	27	6	17.73	3.94	Otsego	5,447	......	......	....	......
Gd. Traverse	22,715	5	1	2.20	0.44	Ottawa	43,739	38	2	8.68	0.46
Gratiot	28,911	14	4	4.84	1.38	Presque Isle	7,441	......	......	....	......
Hillsdale	29,787	5	2	1.68	0.67	Roscommon	1,187	......	......	....	......
Houghton	55,124	14	9	2.54	1.63	Saginaw	81,314	102	17	12.54	2.09
Huron	36,895	15	4	4.07	1.08	Sanilac	35,640	14	3	3.93	0.84
Ingham	42,218	57	8	13.50	1.89	Schoolcraft	8,763	......	......	....	......
Ionia	37,344	6	2	1.61	0.54	Shiawassee	35,232	167	22	47.40	6.24
Iosco	8,735	15	3	17.17	3.43	St. Clair	57,091	24	7	4.20	1.23
Iron	5,628	1	......	1.78	......	St. Joseph	24,751	6	1	2.42	0.40
Isabella	24,758	13	4	5.25	1.62	Tuscola	36,792	32	1	8.70	0.27
Jackson	48,415	10	2	2.07	0.41	Van Buren	31,707	34	14	10.72	4.42
Kalamazoo	45,535	81	4	17.79	0.88	Washtenaw	45,133	4	1	0.89	0.22
Kalkaska	6,240	......	......	....	......	Wayne	336,645	664	143	19.72	4.25
Kent	136,958	214	48	15.63	3.50	Wexford	17,508	11	1	6.28	0.57

*Population estimated by average annual increase, arithmetical method, based on U. S. Census of 1890 and the State Census of 1894; computed in the office of the State Board of Health.

Distribution of diphtheria by counties.—Table 1 exhibits the reported diphtheria by counties during the year 1899. Said table shows, in addition to the actual numbers of reported cases and deaths, the sickness and death-rates per 10,000 of population in each county; thus rendering the relative amount of sickness and death from this disease in the counties more readily conceivable.

Sickness-rates from diphtheria in 1899.—Table 1 shows that the sickness-rate for the whole State during the year was 8.88 per 10,000 of population. By counties, the greatest sickness-rate (47.40) was in Shiawassee County; and the lowest (0.51), was in Chippewa County. In eighteen counties there was no reported sickness from diphtheria.

Death-rates from diphtheria in 1899.—The death-rate for the State was 1.79 per 10,000 population. The highest death-rate (6.24 per 10,000 of population), was in Shiawassee County; and the lowest, where deaths occurred (.22 of one death per 10,000 of population), was in Washtenaw County. From twenty-eight counties there were no reported deaths.

The proportionate case-rate, death-rate and fatality or "case-mortality," in cities, villages and townships.—The proportionate fatality or "case-mortality" from diphtheria in 1899, i. e., the proportion of reported cases which proved fatal, was, for the whole State, 20.2 per cent, or one death to about five cases.

From the data in Table 2 it may be observed that 66 per cent of the cities, 14 per cent of the villages, and 17 per cent of the townships in the State were infected with diphtheria. But the average population of the cities is fourteen times the average of the villages. The lowest case-rate (4.74) occurred in the villages and the lowest death-rate (1.26) occurred in the townships; the highest case-rate (14.21) and death-rate (2.60) occurred in the cities; being about three times as many cases, and twice as many deaths as in the villages. The highest fatality (twenty-eight per cent) occurred in the villages and the lowest (eighteen per cent) occurred in the cities.

TABLE 2.—*Exhibiting the numbers of outbreaks and cases of and deaths from diphtheria which occurred in the cities, villages, and townships of Michigan in 1899, and the comparative numbers of outbreaks, cases, deaths, and fatality from this disease in cities, villages, and townships. (Compiled from reports of local health officials to the Secretary of the State Board of Health.)*

Classes of political divisions and numbers of each class of divisions.	Population.*	Health jurisdictions.	Outbreaks in:			Cases.	Deaths.	Fatality. (Per cent deaths of cases.)	Rates per 10,000 population.	
			Localities.		No. of				Cases.	Deaths.
			No. of	Per cent of all localities.						
State (83 counties)	2,426.331	1,583	303	19	366	2,154	435	20	8.88	1.79
Cities	954,412	77	51	66	77	1,356	248	18	14.21	2.60
Villages	265,548	302	43	14	49	126	35	28	4.74	1.32
Townships	1,206,371	1,204	209	17	240	672	152	23	5.57	1.26

*Estimated by arithmetical method in the office of the State Board of Health.

Diphtheria in each month of the year, 1899.—The last line of figures in Table 3, representing the reported number of outbreaks present, is not derived from the preceding two lines as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. There may be a time during the outbreak when no cases are present, but if the subsequent cases can be attributed to infection from preceding ones, it is called one outbreak. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported, and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months. There were nine more beginnings than endings of outbreaks reported during the year 1899.

TABLE 3.—*Exhibiting the number of outbreaks of diphtheria which were reported to have begun, to have ended, and the number which were present, in each month of the year 1899, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Outbreaks began..	46	17	21	15	21	20	22	16	29	45	43	32	327
Outbreaks ended..	25	33	19	34	12	17	18	12	25	30	43	50	318
Outbreaks present.	61	61	52	49	36	47	47	47	63	84	98	90	....

TABLE 4.—*Exhibiting the number and per cent of localities from which the presence of diphtheria was reported, and the number and per cent of cases of diphtheria present in Michigan in each month during the year 1899. (Includes each case for which, the time during which it existed, was stated in the reports. Each of such cases is counted in each month in which, or part of which, the case was reported to have existed.)*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Localities, number.........	61	58	54	49	36	45	49	48	63	83	98	89
Per cent....................	20.1	19.1	17.8	16.2	11.9	14.9	16.2	15.8	20.8	27.4	32.3	29.4
Cases present, number.....	196	191	173	131	120	101	115	129	198	405	466	303
Per cent....................	9.1	8.9	8.0	6.1	5.6	4.7	5.3	6	9.2	18.8	21.6	14.1
Cases taken sick, number..	188	113	124	81	94	71	80	104	152	356	343	309
Per cent....................	8.7	5.2	5.8	3.8	4.4	3.3	3.7	4.8	7.1	16.5	11.3	14.3

The first line of Table 4 shows, for 1899, the number of localities in Michigan at which diphtheria was present in each month of the year. The second line shows the per cent those localities were of the total number of localities from which the disease was reported.

The third line of the table gives the numbers of cases sick in each month, and the fourth line the per cent those numbers were of the total reported cases.

The fifth line of the table gives the numbers of cases taken sick each month, and the per cent those numbers were of the total reported cases.

Source of contagium of diphtheria and how the disease is spread.—Of the 2,154 cases of diphtheria reported during the year 1899, the local health officers reported the source of contagium as follows: Traced to a former case, 262; traced to cases of "cold," "sore throat," etc., 12; due to infection from "books," "clothing," etc., 5; attributed to unsanitary conditions, 12; due to infection by animals, 2; contagium reported as from outside jurisdiction, 68; contagium reported as probably from outside jurisdiction, 15; unknown, or reports not definite (includes those reported "Contagium," "Sporadic," "Spontaneous," "De novo," etc.), 1,044; source not reported, 734; total, 2,154.

Cases of diphtheria traced to preceding cases of the disease.—As shown above, 262 of the 2,154 reported cases of diphtheria in Michigan in 1899, were traced to preceding cases of the disease. Had all *first* cases in the various jurisdictions been properly isolated, no doubt a large part of these 262 cases would have been prevented.

In 1899, as in previous years, a number of cases of diphtheria were attributed to "unsanitary conditions." While such conditions may favor the spread of the disease and facilitate its assuming increased malignancy, the disease cannot be originated by those unsanitary conditions. The "germ," or contagious principle, of the disease, must be present or the disease will not exist.

The contagium of diphtheria was reported by local health officers to have spread from thirty-five first localities to fifty-three other (second) localities, resulting in fifty-three outbreaks with an aggregate of one hundred and sixty-eight cases and thirty-eight deaths; and from four of these (second) localities to other (third) localities resulting in four outbreaks, fifteen cases and five deaths. Nine outbreaks with an aggregate of twenty-one cases and one death, were traced to localities outside of Michigan. The source of contagium of sixteen outbreaks with an aggregate of forty-six cases and four deaths, was reported as *probably* traced to outbreaks in other jurisdictions in Michigan; and four outbreaks, with seventeen cases and two deaths, as probably traced to outbreaks in localities outside the State.

Estimated number of cases of diphtheria prevented and lives saved by isolation and disinfection.—Tables 5 and 6 and diagram (Plate No. 1060) compare the average numbers of cases and deaths in outbreaks of diphtheria where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in those outbreaks where these measures were neglected.* By Table 5 it may be seen that during the thirteen years, 1887-99, there were over five times as many cases and deaths per outbreak in those outbreaks in which these measures were neglected as in those outbreaks in which they were enforced.

By Table 6 it may be seen that during the year 1899 there were reported to the office of the State Board of Health 348 outbreaks of diphtheria, with 1,116 cases and 248 deaths. Had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 1,392 cases and 372 deaths, and taking from these respectively the cases (1,116) and deaths (248) which did occur, leaves 276 cases and 124 deaths indicated as prevented in these 348 outbreaks, by isolation and disinfection. By the same method of computation for each year the indicated saving during the thirteen years, 1887-99, is 36,246 cases and 7,438 lives.

Definition of Outbreak.—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the later cases are considered as part of the same outbreak. Possibly the sixty-day limit may at some future time be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area. Also, comparisons of *years* require that outbreaks be counted as closed, at the end of the *year;* while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks,* even where they extend from one year into the next. This explains any apparent discrepancy between the numbers of outbreaks, cases and deaths here given and the numbers given at the beginning of this article.

Tables 5 and 6 and the diagram (Plate No. 1060) show in 1899, as compared with 1898, and also with the thirteen-year period, 1887-99, a very considerable decrease in the number of outbreaks, in the cases per outbreak and in the deaths per outbreak.

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*In the compilation of the reports for Tables 5 and 6 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate and disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed "Isolation and disinfection enforced." If, however, he neglects to properly isolate and disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

TABLE 5.—DIPHTHERIA IN MICHIGAN, 1887-99: *Exhibiting for the 13 years, and for each of the 13 years 1887-99, the numbers of reported outbreaks, cases and deaths; also for this 13 year period, the average number of cases and deaths per outbreak in all outbreaks; in those outbreaks in which isolation or disinfection was doubtful; in which both isolation and disinfection were neglected; in which both isolation and disinfection were enforced; and also the numbers of cases and deaths indicated to have been prevented by isolation and disinfection.*

Years.	All outbreaks.*			Isolation and disinfection, or both, not mentioned, or statements doubtful.			Isolation and disinfection both neglected.			Isolation and disinfection both enforced.			Indicated saving of cases and lives by isolation and disinfection.	
	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Out. breaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Cases.	Deaths.
1887	398	2,321	561	202	732	190	60	822	195	78	198	51	† 3,132	† 733
1888	311	1,529	324	199	810	189	34	527	81	58	101	31	3,292	416
1889	376	1,986	418	254	1,314	280	41	478	108	63	98	14	2,398	570
1890	439	2,713	619	291	1,649	401	71	902	169	46	70	15	2,862	426
1891	532	2,965	643	366	1,777	389	79	944	194	70	157	33	3,392	666
1892	525	3,485	740	323	2,341	456	52	657	147	49	105	24	3,146	746
1893	536	3,133	746	303	1,681	362	74	1,020	282	65	159	45	4,253	1,296
1894	420	2,262	404	202	986	174	56	738	122	81	176	37	3,274	512
1895	388	2,292	425	178	1,102	209	45	610	119	70	146	28	2,969	599
1896	405	2,460	432	153	925	165	64	794	142	69	164	27	2,566	467
1897	464	2,838	497	165	916	137	100	1,366	252	93	225	46	3,500	672
1898	399	1,535	308	127	516	114	79	539	103	77	149	28	1,186	211
1899	348	1,116	248	106	391	92	68	272	73	91	213	34	276	124
Totals for the 13 yrs., 1887-99.	5,541	30,635	6,365	2,869	15,140	3,158	823	9,669	1,987	910	1,961	413	‡36,246 ‡34,472	‡7,438 ‡6,989
Av. for the 13 yrs., 1887-99	426	2,357	490	221	1,165	243	63	744	153	70	151	32	2,788	572
Av. cases and deaths per outbreak for the 13 years, 1887-99	....	5.53	1.15	....	5.28	1.10	....	11.75	2.41	....	2.16	0.45		

*These do not include the cases and deaths in a number of the larger cities and one township (foot-note to Table 6), because of the difficulty in determining the beginning and ending of an outbreak in those cities and township, in which the disease was present in some part of those jurisdictions nearly all the year. †The numbers of cases and deaths in this double column are found by multiplying "All outbreaks" for each year by the average number of cases, or deaths per outbreak in those outbreaks in which "Isolation and disinfection both were neglected," for that year, and deducting from the result thus obtained, the cases or deaths, as the case may be, which were *reported* to have occurred that year. ‡The two sets of numbers appearing in this column are based on two distinct methods of solution which are explained as follows: (1) the 36.246 cases and 7,438 deaths are totals of the columns representing cases and deaths saved as explained in the † foot-note; (2) the 34,472 cases and 6,989 deaths are obtained by multiplying the average numbers of cases and deaths per outbreak for the thirteen years, 1887-99 (11.75 and 2.41 where isolation and disinfection were neglected), by the total number of outbreaks to find the numbers which would have occurred if all outbreaks had been neglected and subtracting therefrom the numbers of cases and deaths that were reported as having occurred during the thirteen year period.

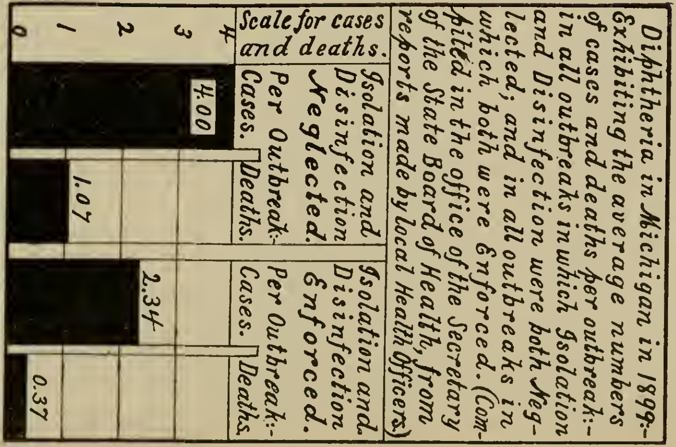
TABLE 6.—DIPHTHERIA IN MICHIGAN IN 1899:—*Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 348 outbreaks reported; (2) in the 106 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 9 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 35 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 19 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 20 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 68 outbreaks in which isolation and disinfection were both neglected; (8) in the 91 outbreaks in which isolation and disinfection were both enforced.*

	(1) All outbreaks. (348 outbreaks.*)		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (106 outbreaks.)		(3) Disinfection enforced—isolation doubtful. (9 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (35 outbreaks.)		(5) Disinfection enforced—isolation neglected. (19 outbreaks.)		(6) Isolation enforced—disinfection neglected. (20 outbreaks.)		(7) Isolation and disinfection both neglected. (68 outbreaks.)		(8) Isolation and disinfection both enforced. (91 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	1,116	248	391	92	12	5	110	18	73	22	45	4	272	73	213	34
Averages.	3.21	0.71	3.69	0.87	1.33	0.56	3.14	0.51	3.84	1.16	2.25	0.20	†4.00	†1.07	†2.34	†0.37

*These do not include the cases and deaths in Detroit, Grand Rapids, Kalamazoo and Calumet Township because of the difficulty in determining the beginning and ending of an outbreak in these localities, in which the disease was present in some part of the locality nearly all the year.

†These figures are graphically represented in the diagram, Plate No. 1060, on this page.

ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.



[PLATE 1060.]

TABLE 7.—*Exhibiting the reported period of incubation, stated in days, in 115 cases of diphtheria. Compiled from reports of health officers in Michigan, for the year 1898.*

Incubation period—days....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	18	21	24
Cases in each period.........	2	3	*1	†5	‡7	§3	¶10	4	2	‖12	5	**3	2	††5	‡‡1	2	2	1

* In this case *about* 3 days.
† In 1 of these cases *about* 4 days.
‡ In 1 of these cases *about* 5 days.
§ In 1 of these cases *about* 6 days.
¶ In 1 of these cases *about* 7 days.
‖ In 7 of these cases *about* 10 days.
** In 1 of these cases *about* 12 days.
†† In 2 of these cases *about* 14 days.
‡‡ In this case *about* 16 days.

The average period of incubation of diphtheria in the 70 cases is 8.7 days.

TABLE 8.—*Exhibiting in certain age-groups, the numbers of cases and deaths from diphtheria, the per cent that the cases in each group were of all cases of known ages; the per cent that the deaths in each group were of all deaths at known ages; and the per cent that the deaths in each group were of the cases in that group.—Compiled from all reports for the year 1899, which stated the ages.*

	Number and per cent of cases and deaths in certain age groups.																
Ages in groups of years.	All known ages.	0-1.	1-2.	2-3.	3-4.	4-5.	Under 5.	5-9.	10-14.	15-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-49.	50 and over.
No of cases.............	*1,768	33	83	122	134	144	516	594	287	121	92	63	36	24	16	5	14
Per cent the cases in each group were of all cases of known ages..	100	1.9	4.7	6.9	7.6	8.1	29.2	33.6	16.2	6.8	5.2	3.6	2.0	1.4	.9	.3	.8
No. of deaths	408	26	44	53	47	40	210	130	38	17	6	3	1	1	1	1	....
Per cent the deaths in each group were of all cases in that group....	23.1	78.8	53.0	43.4	35.1	27.8	40.7	21.9	13.2	14.0	6.5	4.8	2.8	4.2	6.3	20.0	....
Per cent the deaths in each group were of deaths, known ages...	100	6.4	10.8	13	11.5	9.8	51.5	31.9	9.3	4.2	1.5	0.7	0.2	0.2	0.2	0.2	....
Per cent the deaths in special groups were of all deaths, known ages.	....	51.5					83.3		15.			1.7					

*Does not include those cases or deaths where the age was not stated.

Of the 16,299 persons sick with diphtheria in the State during the seven years, 1892-98, the ages of whom were reported to this office, the largest percentage were of ages ranging from five to nine years; and seventy-seven per cent of the whole number were of ages under fourteen years.

Of the 3,496 deaths reported to have occurred during the same period the greatest percentage were of ages under five years and ninety per cent died at ages under fourteen years.

TABLE 9.—*Exhibiting in certain age-groups, the numbers of cases and deaths from diphtheria in the year 1899; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths, also totals for the 7 years 1892-98.—Compiled from all reports for the years 1892-99, which stated the ages.*

Year.		Total No. included.	Per cent of cases and deaths in certain age groups.											
			All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Cases.........	1,768	100	29.2	33.6	16.2	6.8	5.2	3.6	2.0	1.4	0.9	0.3	1.1
	Deaths........	408	100	51.5	31.9	9.3	4.2	1.5	0.7	0.2	0.2	0.2	0.2	......
1892-98.	Cases.........	16,299	100	25.4	32.6	19.0	8.6	4.5	3.3	2.6	1.7	1.0	0.6	0.6
	Deaths........	3,496	100	42.7	33.6	14.0	4.4	2.0	1.3	0.8	0.5	0.2	0.2	0.4

TABLE 10.—*Exhibiting, by sex, the per cent of persons in certain age-groups, who recovered from diphtheria, in Michigan in 1899, and during the 6 years 1893-8, also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of non-fatal cases, years.	No. of cases included.	Age.—In periods of years. Per cent of (non-fatal) cases in each period of age.											
				All ages.	Under five years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Males.....	10.06	661	100	27.1	37.4	16.3	6.1	4.7	2.7	2.4	1.4	1.2	0.3	0.5
	Females ..	12.8	699	100	18.2	31.0	20.2	9.2	7.9	6.0	2.7	2.0	1.0	0.3	1.6
1893-8.	Males.....	11.2	5,264	100	22.2	34.7	21.5	9.2	4.1	2.8	2.1	1.6	0.9	0.5	0.5
	Females ..	13.3	6,385	100	16.5	30.6	21.6	10.4	6.2	4.4	3.9	2.9	1.6	0.8	1.1

Table 10 shows for 1899 that the average age of non-fatal cases of diphtheria was, for males, 10.06 years, and for females 12.8 years; and that for the six years, 1893-98, the average age of males was 11.2 and for females 13.3 years. Also that for both the year 1899 and for the period of years 1893-98, the greatest per cent of cases occurred at ages ranging from five to nine years.

TABLE 11.—*Exhibiting, by sex and in certain age-groups, the per cent of persons who died from diphtheria in Michigan in 1899 and during the 6 years 1893-98; also the average age at death, and the number of deaths included. (Compiled from such reports as stated the ages.)*

Deaths from diphtheria.											
Year.	Sex.	Average age, years.	No. of deaths included.	Ages.—In periods of years. Per cent of deaths in each period of age.							
				All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 years and over.
1899.	Males	5.07	181	100	56.9	28.2	8.8	4.4	1.7	......	....
	Females	6.44	227	100	47.1	34.8	9.7	4.0	1.3	1.3	1.8
1893-98.	Males	6.9	1,414	100	42.1	36.0	13.1	4.9	1.7	0.7	1.4
	Females	8.2	1,606	100	38.0	34.3	16.3	4.5	2.0	2.1	2.8

Table 11 shows for 1899 that the average age of decedents from diphtheria was, for males 5.07 years, and for females 6.44 years; and for the six years 1893-98 that the average age of decedents from diphtheria was, for males 6.9 years and for females 8.2 years. Also that the greatest per cent of decedents, both in 1899 and in the period 1893-98, were of ages under five years.

Average duration of diphtheria.—Fatal and non-fatal cases.—In 1899 the average duration of fatal cases of diphtheria was, for males, 5.5 days, for females 5.7 days, and for both sexes 5.6 days.

TABLE 12.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from diphtheria, in Michigan, during the year 1899, and in the 6 years 1893-98. Per cent of deaths arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of diphtheria.											
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period of days.								
			All cases.	1 to 5 days.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 and over.
1899.	Males	127	100	65	17	10	6	......	......	.8	....
	Females	175	100	62	23	10	3	.6	.6	.6	.6
1893-8.	Males	897	100	47	31	12	5	2	1	1	1
	Females	1,024	100	48	30	13	5	2	1	......	1

In 1899 the average duration of non-fatal cases of diphtheria was, in males, 12.2 days, in females 12.6 days, and in both sexes 12.4 days.

TABLE 13.—*Exhibiting, by sex of patient, the duration (in days) of non-fatal cases of sickness from diphtheria, in Michigan, during 1899, and the 6 years 1893-98. Per cent of non-fatal cases arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of diphtheria.											
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of non-fatal cases in each period of days.								
			All periods.	1 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 days and over.
1899.	Males	593	100	18	38	16	10	12	3	1	2
	Females	643	100	14	38	19	12	13	3	8	2
1893-8.	Males	3,075	100	10	33	26	14	9	4	2	2
	Females	3,734	100	10	34	25	15	9	3	1	2

Cats believed to have conveyed diphtheria.—The health officer of Allegan Township, Allegan County, reporting an outbreak of diphtheria at the county house in his jurisdiction, wrote as follows:—

> "Cats seemed to have retained the disease from last attack at same house. I believe it to have been caused from and retained by cats of the county farm."

Supposed infection from old wall paper.—Relative to the source of contagium in an outbreak of diphtheria in his jurisdiction, the health officer of Cheboygan city wrote:—

> "The father was a paper-hanger. In removing old paper from rooms infected some years ago I think the germs were carried home to the child."

Diphtheria spread by a cat.—January 12, 1899, the health officer of Kalamazoo city reporting an outbreak of diphtheria in his jurisdiction wrote:—

> "I have the honor to report to you an outbreak of diphtheria in this city. The source of the contagion is through a stray cat. The number of cases occurring from this source are five. I send you a copy of each of our city papers regarding this outbreak. Though it is written in a sort of a sensational way, yet the publishing of this even in this manner may be of some benefit to our citizens."

The substance of the paragraphs in the daily papers referred to by the health officer in his letter was as follows:—

> "Some time ago diphtheria broke out in the family of John Hockstra, 903 North Edwards street, and three cases developed. Dr. H. B. Osborne attending the cases was unable to trace the origin of the disease. He and Health Officer O'Brien consulted over the matter, but were unable to come to any satisfactory decision, but as a last resort thought it might be possible that a stray cat that had been around the infected house might be the cause of the trouble.
>
> "Working on this theory Health Inspector Tichnor caught the cat a couple of days ago and Dr. A. W. Crane swabbed the cat's throat. The mucus thus obtained was subjected to the regular examination and Thursday Dr. Crane reported to Health Officer O'Brien that he had found diphtheria bacilli in the mucus taken from the cat's throat, in great numbers.
>
> "This proves conclusively that the cat was the source of contagion in these three cases, as the children were playing with it for several days before being taken down. Another case in the family of a Mr. Kools, across the street, is also traced to the same source. The cat undoubtedly took the disease from a family named Siebert, at 833 North Burdick, where they had diphtheria, and it was in the habit of hanging around.
>
> "The cat has been killed by order of Health Officer O'Brien. This case goes to show that people afflicted with contagious diseases cannot be too careful regarding little things which might be liable to spread disease."

Silver coin suspected of being a vehicle of transmission of diphtheria.—Relative to the source of contagium in an outbreak of diphtheria in his jurisdiction, the health officer of Champion Township, Marquette County, wrote:

> "In August, 1898, a man visited the house, coming from Norway, Mich. His children had had diphtheria. He gave the children of the visited house some silver money, which was put away, to be taken out and played with ten days before child became stricken with diphtheria."

Malignant diphtheria spread from light case of the disease.—In Antrim Township, Shiawassee County, a child had a sore throat which the mother of the child treated for a couple of days and then called in a physician, who advised the mother that the children had best be kept home from school and that no one should be allowed to enter the house. The rooms of the house so opened into each other that the children could not be kept separate from the sick child. In this outbreak there were seven cases and four deaths. The attending physician gives as the source of the contagium: An uncle who had slept in a house which had been but recently disinfected on account of diphtheria came down with a sore throat and this child had sat on the uncle's lap. In nine days from that time the child came down with the sore throat, which proved to be diphtheria.

These seven cases and four deaths might have been prevented: first, if the house in which the uncle had slept had been *thoroughly* disinfected, before the uncle had slept in it; second, if the uncle had been kept under careful observation or isolated until the disease either proved to be or not to be diphtheria; and third, most of the cases might have been prevented if the child, which probably became infected by sitting on its uncle's lap, had been placed in an isolation hospital, or in some way thoroughly isolated, so that the other children would not have been exposed to the disease.

SCARLET FEVER IN MICHIGAN.—YEAR ENDING DECEMBER 31, 1899.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health 655 outbreaks of scarlet fever in 503 localities in Michigan, which resulted in 4,345 cases and 171 deaths.

The average numbers of cases of sickness and of deaths per outbreak, in 1899, were 6.63 cases and .26 deaths. The fatality, i. e., the proportion of reported cases which proved fatal, was 3.9 per 100 cases.

Scarlet fever in 1899, compared with previous years.—From year to year there has been a steady improvement, both in the methods adopted by the State Board of Health in securing and compiling reports, and in the efforts made by local health authorities throughout the State to furnish in their reports the information desired by the State Board. These facts, together with the constantly increasing population, make it difficult to determine the exact increase or decrease of prevalence of the disease in the State by comparison of the numbers of outbreaks of the disease, and the cases and deaths resulting therefrom, and this should be borne in mind in studying Exhibit 1. It might reasonably be expected that these facts will produce a constant increase in the reported prevalence of the disease.

For 1899 there were reported 1,936 cases and 71 deaths more than there were reported for 1898.

Compared with the average numbers of cases and deaths per year reported for the fifteen years, 1884-98, there were reported for 1899, 456 more cases, but 52 less deaths. Probably these two facts (more cases, less deaths) were, in part at least, results of more accurate diagnoses and consequent reporting of mild cases, such as heretofore would not have been reported, making it possible to better restrict the spread of the disease in each locality.

While there were reported in 1899, 185 more outbreaks and in 106 localities more than the annual averages for the fifteen years preceding, the average numbers of cases and deaths *per outbreak* were less in 1899.

EXHIBIT I.—SCARLET FEVER IN MICHIGAN.—*Numbers of reported outbreaks, localities (in which they occurred), cases and deaths; average numbers of cases and deaths per outbreak, and the per cent of cases which proved fatal, as reported for the year 1899; with the departures of the same for 1899 from the averages of the same for the 15 years, 1884-98.*

Year.	Reported outbreaks.	Reported localities.	Reported cases.	Av. No. of cases per outbreak.	Reported deaths.	Av. No. of deaths per outbreak.	Deaths per 100 cases.
1899	655	503	4,345	6.63	171	.26	3.9
Average for fifteen years, 1884-98	470	397	3,889	8.27	223	.47	5.7
Departures of 1899 from the averages for 15 years, 1884-98	+185	+106	+456	−1.64	−52	−.23	−1.8

TABLE 1.—*Numbers of cases and deaths reported from scarlet fever, and the cases and deaths per 10,000 persons living in each county in Michigan during the year 1899. (Compiled from reports of health officers, clerks, etc.)*

State and counties.	Estimated population of Michigan for 1899.*	Number of reported		Number per 10,000 population of	
		Cases.	Deaths.	Cases.	Deaths.
State	2,426,331	4,345	171	17.91	.70
Alcona	5,429	0	0	0	0
Alger	1,569	0	0	0	0
Allegan	39,474	31	1	7.85	.25
Alpena	20,387	3	0	1.47	0
Antrim	14,946	77	16	51.52	10.71
Arenac	8,518	46	3	54.00	3.52
Baraga	5,727	0	0	0	0
Barry	23,594	24	1	10.17	.42
Bay	67,419	236	6	35.00	.89
Benzie	11,596	10	1	8.62	.86
Berrien	51,073	222	9	43.47	1.76
Branch	25,477	21	0	8.24	0
Calhoun	52,436	108	1	20.60	.19
Cass	21,455	29	1	13.52	.47
Charlevoix	12,637	53	1	41.94	.79
Cheboygan	16,293	113	8	69.55	4.91
Chippewa	19,451	16	0	8.23	0
Clare	8,499	0	0	0	0
Clinton	25,953	81	2	31.21	.77
Crawford	2,395	0	0	0	0
Delta	24,177	160	5	66.18	2.08
Dickinson	15,635	45	8	28.78	5.11
Eaton	33,273	38	0	11.42	0
Emmet	13,045	22	0	16.86	0
Genesee	41,957	57	0	13.59	0
Gladwin	5,765	7	0	12.14	0
Gogebic	15,229	1	0	.66	0
Gd. Traverse	22,715	23	0	10.13	0
Gratiot	28,911	34	2	11.76	.69
Hillsdale	29,787	40	2	13.43	.67
Houghton	55,124	145	16	26.30	2.90
Huron	36,895	57	2	15.45	.54
Ingham	42,218	113	1	26.77	.24
Ionia	37,344	62	1	16.60	.27
Iosco	8,735	1	0	1.14	0
Iron	5,628	5	0	8.88	0
Isabella	24,758	71	2	28.68	.81
Jackson	48,415	57	1	11.77	.21
Kalamazoo	45,535	180	12	39.53	2.64
Kalkaska	6,240	3	0	4.81	0
Kent	136,958	251	9	18.33	.66
Counties.					
Keweenaw	2,829	10	1	35.35	3.53
Lake	5,137	1	0	1.95	0
Lapeer	28,460	17	0	5.97	0
Leelanau	11,310	2	0	1.77	0
Lenawee	48,657	156	1	32.06	.21
Livingston	19,911	15	0	7.53	0
Luce	2,214	0	0	0	0
Mackinac	6,496	9	0	13.85	0
Macomb	34,105	35	1	10.26	.29
Manistee	28,469	9	0	3.16	0
Marquette	40,418	19	0	4.70	0
Mason	20,968	13	0	6.20	0
Mecosta	22,019	12	0	5.45	0
Menominee	25,248	4	3	1.58	1.19
Midland	16,419	37	0	22.53	0
Missaukee	9,339	10	1	10.71	1.07
Monroe	34,236	92	2	26.87	.58
Montcalm	36,059	52	3	14.42	.83
Montmorency	3,627	15	0	41.36	0
Muskegon	33,963	19	0	5.59	0
Newaygo	17,436	27	0	15.49	0
Oakland	44,465	42	0	9.45	0
Oceana	17,725	14	0	7.90	0
Ogemaw	5,707	19	0	33.29	0
Ontonagon	10,769	6	0	5.57	0
Osceola	18,781	8	1	4.26	.53
Oscoda	1,683	14	2	83.18	11.88
Otsego	5,447	66	4	121.17	7.34
Ottawa	43,739	24	1	5.49	.23
Presque Isle	7,441	0	0	0	0
Roscommon	1,187	0	0	0	0
Saginaw	81,314	60	1	7.38	.12
Sanilac	35,640	35	1	9.82	.28
Schoolcraft	8,763	22	0	25.11	0
Shiawassee	35,232	32	2	9.08	.57
St. Clair	57,091	118	6	20.67	1.05
St. Joseph	24,751	23	0	9.29	0
Tuscola	36,792	65	1	17.67	.27
Van Buren	31,707	55	1	17.35	.32
Washtenaw	45,133	134	2	29.69	.44
Wayne	336,645	537	23	15.95	.68
Wexford	17,508	75	3	42.83	1.71

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*Population estimated by average annual increase, arithmetical method, based on U. S. Census of 1890 and the State Census of 1894; computed in the office of the State Board of Health.

Sickness-rates, by counties, from reported scarlet fever.—Table 1 shows that the greatest sickness-rate from reported scarlet fever, by counties, was in Otsego County, where the ratio of cases to population was 121.17 to 10,000. This was nearly seven times the average rate for the State, and nearly double the sickness-rate for any other county, except Oscoda County, where the sickness-rate was 83.18 cases per 10,000 population. (Oscoda County in 1898 had a high sickness-rate, 111.24 cases per 10,000 population.) In eight counties there was no reported sickness from scarlet fever.

Death-rates, by counties, from reported scarlet fever.—Table 1 shows that the greatest death-rate from reported scarlet fever, 11.88 deaths per 10,000 inhabitants, was in Oscoda County.

From thirty-nine counties, from which an aggregate of 518 cases of scarlet fever were reported, there were no deaths reported from this disease. The lowest death-rate, in counties from which deaths from this disease were reported, was in Saginaw County. This county had .12 of one death per 10,000 inhabitants.

Fatality, by counties, from reported scarlet fever.—The fatality from scarlet fever in 1899 was, for the whole State, 3.9 per cent, or about one death to twenty-five cases. In Menominee County, three of the four cases reported proved fatal. The lowest fatality in counties from which deaths were reported, .64 per cent of reported cases, occurred in Lenawee County.

Distribution of scarlet fever in cities, villages and townships.—From the data in Table 2 it may be observed that 74 per cent of the cities, 34 per cent of the villages, and 28 per cent of the townships, were infected with scarlet fever. But the average population of the cities is over fourteen times the average population of the villages.[*] The highest case-rate (22.78) and death-rate (1.05) occurred in the villages.

TABLE 2.—*Exhibiting the numbers of outbreaks and cases of and deaths from scarlet fever which occurred in the cities, villages and townships of Michigan in 1899, and the comparative numbers of outbreaks, cases, deaths, and fatality from this disease in cities, villages, and townships. (Compiled from reports of local health officials to the Secretary of the State Board of Health.)*

Classes of political divisions.	Population.[†]	Health jurisdictions.	Outbreaks in:			Cases.	Deaths.	Fatality. (Per cent cases of deaths)	Rates per 10,000 population.	
			Localities.							
			No. of	Per cent of all localities.	No. of				Cases.	Deaths.
State (83 counties)	2,426,331	1,583	503	32	655	4,345	171	3.9	17.91	.70
Cities	954,412	77	57	74	87	1,645	55	3.3	17.24	.58
Villages	265,548	302	103	34	131	605	28	4.6	22.78	1.05
Townships	1,206,371	1,204	343	28	437	2,095	88	4.2	17.37	.73

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[*] The average population of the cities is 12,395, of the villages, 879, and of the townships, 1,002.

[†] Estimated by arithmetical method in the office of the State Board of Health.

Scarlet fever in each month of the year 1899.—The last line of figures in Table 3, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. Of the thirty-eight outbreaks reported as having ended in January, fourteen were outbreaks which began the preceding year, and in which there were no new cases reported in 1899. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months. There were seventy-seven more beginnings than endings of outbreaks reported during the year 1899.

TABLE 3.—*Exhibiting the reported number of outbreaks of scarlet fever which began, the number which ended, and the number which were present, in each month of the year 1899, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Number began.....	68	54	46	36	40	32	31	43	53	72	59	65	599
Number ended.....	38	44	53	35	41	38	36	26	25	39	65	82	522
Number present...	105	128	125	106	110	100	91	100	124	168	186	186	....

TABLE 4.—*Exhibiting the number and per cent of localities infected with scarlet fever, and the number and per cent of cases of scarlet fever present, and the number and per cent of cases taken sick, in Michigan in each month during the year 1899.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Localities, number.........	119	127	121	105	110	99	89	94	124	165	181	181
Per cent....................	23.7	25.2	24.1	20.9	21.9	19.7	17.7	18.7	24.7	32.8	36.0	36.0
Cases present, number.....	311	410	347	345	339	309	288	299	496	744	740	798
Per cent....................	7.2	9.4	8.0	7.9	7.8	7.1	6.6	6.9	11.4	17.1	17.0	18.4
Cases taken sick............	288	226	199	250	246	192	207	210	384	493	467	559
Per cent....................	6.6	5.2	4.6	5.8	5.7	4.4	4.8	4.8	8.8	11.3	10.7	12.9

The second line of figures in Table 4 shows the per cent the localities infected in each month are of the exact number of localities (503) *reported* to this office for the year 1899.

The third line of figures in Table 4 shows the number of cases reported sick in any part of each month.

As some of the cases were sick longer than one month they are included in the cases sick in more than one month, therefore the sum of the cases sick in all the months exceeds the total of reported cases in 1899.

The fourth and last lines of figures in Table 4 show the per cent the cases present and the per cent the cases taken sick, in each month, are of the exact number of cases (4,345) *reported* to this office for the year 1899.

Source of contagium of scarlet fever, how the disease is spread, and the vitality of the contagium.—Of the 4,345 cases of scarlet fever reported during the year 1899, the local health officers reported the source of contagium, as follows: Traced to a former case, 952; probably traced to a former case, 5; attributed to infected houses, articles, clothing, etc., 16; source of contagium unknown, 2,448; source of contagium not stated, 782; traced to an outside jurisdiction, 117; probably from an outside jurisdiction, 25.

The germ of scarlet fever is not yet demonstrated; but that there is a germ seems to be proved by the known communicability of the disease.

Reports of health officers and physicians indicate that the scarlet fever germ frequently retains its vitality for a long time outside of the human body, in an apparently dormant or inactive state, in houses, clothing, carpets, furniture, etc., and is then capable of developing scarlet fever in persons coming into such houses or in contact with or near such articles, thus showing the importance of carefully disinfecting all infected houses and articles, even where they are not to be used for a long time.

The following quotations are from a few of such reports sent to this office:—

"Think it was from dress goods from a house that had it six months ago."—*Marion Holland, M. D., Cassopolis Village, Cass County.*

"From old files of 'Youth's Companion' used two years ago with sick child."—*R. C. Fraser, M. D., Somerset Township, Hillsdale County.*

"Handling a book that her father used in a similar manner when ill with the disease twenty years ago."—*C. L. Wilbur, Pulaski Township, Jackson County.*

"From Ohio by a letter."—*G. W. Ross, M. D., Cambridge Township, Lenawee County.*

The contagium of scarlet fever was reported by local health officers to have spread in various ways from eighty-two outbreaks to other jurisdictions, resulting in 116 outbreaks, with an aggregate of 683 cases and thirty-three deaths; and from some of these localities to other localities, resulting in eleven outbreaks with an aggregate of thirty cases; and further, from one of these outbreaks to a fourth locality, resulting in one case.

Eighteen outbreaks, with an aggregate of seventy-nine cases and two deaths, were traced to localities outside of Michigan; and from one locality so infected the contagium further spread to another locality, resulting in six cases, and from thence to a third locality, with one case.

The source of contagium of twenty-four outbreaks, with an aggregate of 195 cases and four deaths, was reported as *probably* traced to outbreaks in other jurisdictions in Michigan; and four outbreaks, with seventeen cases, as *probably* traced to outbreaks outside of the State.

Movements of contagium of scarlet fever.—Exhibit 2, "Movements of contagium," shows the sources and directions of movements of scarlet fever in Michigan, where the contagium was reported by health officers to have been introduced into their jurisdictions from localities outside the State, or from other jurisdictions within the State.

EXHIBIT 2.—*First, second and third localities, where the second locality was infected with scarlet fever from the first, and the third was infected from the second; and the number of cases and deaths from scarlet fever in the first, second and third localities, with the dates of the beginning and ending of each outbreak. (Compiled from reports of health officers who were able to trace the source of the contagium to other localities.)*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Allegan county:	....	....	Van Buren county: Geneva township...... (Apr. 2-Aug. 5.)	4	0	Van Buren county: South Haven Towns'p (Aug. 20-Sept. 9.)	1	0
Antrim county: Echo township.......... (Sept. 10-Feb. 14, 1900.)	9	4	Antrim county: Central Lake township (Oct. 13-Jan. 18, 1900.)	28	10	Antrim county: Kearney township.... (Dec. 1-Dec. 6.)	3	0
			Jordan township....... (Oct. 23-Nov. 20.)	6	2	Charlevoix county: Wilson township...... (Oct. 27-Nov. 8.)	2	0
Arenac county: Standish township ..... (July 25-Aug. 1.)	1	1	Arenac county: Mason township .... (Oct.-Oct. 13.)	1	0			
Barry county: Middleville village.....	*	....	Allegan county: Martin township....... (Nov.-Dec.)	4	0			
Bay county: Bay City................ (Jan. 1-Dec. 31.)	225	5	Arenac county: AuGres township...... (Oct. 4-Oct. 13.)	14	1			
			Whitney township..... (Oct. 9-Nov. 9.)	7	1			
			Bay county: Monitor township...... (Dec. 20-Apr. 24, 1900.)	12	1			
			Saginaw county: Blumfield township.... (July 23-Sept. 13.)	3	0			
			Kochville township.... (Nov. 29-Dec. 18.)	1	0			
			Tuscola county: Freemont township.... (Aug. 2-Apr., 1900.)	16	0			
Berrien county: Benton Harbor city.... (Aug. 15-Dec. 31.)	46	0	Berrien county: Benton township .... (Sept. 22-Dec. 23.)	4	0			
			Sodus township .... (Aug. ——.)	1	0			
			St. Joseph township ...	16	1			
			Van Buren county: Lawrence village...... (Oct. 21-Nov. 15.)	3	0			
Berrien county: St. Joseph city.......... (May 3-Dec. 28.)	57	3	Berrien county: Sodus township........ (Aug. 30-Jan., 1900.)	20	0			
Branch county: Bronson village........	*	....	St. Joseph county: White Pigeon village.. (Feb. 21-May 18.)	3	0			
Branch county: Butler township........ (Oct. 12-Mar. 19, 1900.)	15	0	Hillsdale county: Litchfield village...... (Dec. 7-Dec. 21.)	2	0			

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*Scarlet fever was not reported to this office by the health officer of the "first" locality at the time it was said to have spread from there, showing that the disease, if present, was neglected; probably it was not reported to the health officer as the law requires.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Calhoun county: Battle Creek city (Jan.-Dec.)	85	1	Barry county: Assyria township (July 13-Aug. 10.)	10	0			
			Clinton county: Eagle township (Dec. 15-Dec. 25.)	1	0			
			Kalamazoo county: Climax village (Sept. 16-Dec. 31.)	12	0			
Cass county: Marcellus village	*	....	Cass county: Penn township (Mar. 6-May 30.)	5	0	Cass county: Porter township (May 4-May 25.)	1	0
Charlevoix county: Charlevoix village (Jan.-April 22.)	10	0	Charlevoix county: Marion township (Jan.-Feb. 10.)	3	0			
Cheboygan county: Cheboygan city (Jan.-Feb., 1900.)	126	5	Mackinac county: Mackinac Isla'd village (Nov.-Dec.)	11	1			
Clinton county: DeWitt township (June 5-Dec.)	4	0	Clinton county: Olive township (Nov. 27-Dec. 1.)	15	0			
Clinton county: Westphalia township	*	....	Clinton county: Eagle village (May 5-May 31.)	4	0			
Delta county: Escanaba city (Aug.-Jan. 7, 1900.)	140	4	Delta county: Bark River township (Aug. 22-Sept. 10.)	8	0			
Eaton county: Bellevue village (Dec. 2-Feb. 3, 1900.)	6	0	Eaton county: Bellevue township (Dec. 4-Jan. 6, 1900.)	6	0			
Emmet county: Petoskey village (Jan. 20-July 10.)	16	0	Antrim county: Bellaire village (Apr. 5-Apr. 24,)	1	0			
Genesee county: Flint city (Sept. 24-May 21, 1900)	53	0	Genesee county: Davison township (Nov. 23-Jan. 5, 1900.)	9	0			
			Tuscola county: Dayton township (Dec. 8-Mar. 25, 1900.)	8	0			
Genesee county: Flint city (Jan. 18-June 20.)	13	0	Genesee county: Flint township (June 2-July 7.)	2	0			
Grand Traverse county: Traverse City (Feb. 20-Mar. 30.)	1	0	Montcalm county: Richland township (Feb. ——.)	1	0			
Grand Traverse county: Whitewater township (Mar. 24-May 18.)	17	0	Antrim county: Elk Rapids township (Apr. 20-May 6.)	13	0			
Gratiot county: Alma village (Dec. 13-Jan. 4, 1900.)	3	0	Isabella county: Shepherd village	1	0			
Gratiot county	....	....	Isabella county: Shepherd village (Jan. 14-Apr. 4.)	5	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Hillsdale county: Hillsdale city (Sept. 6–Oct. 25.)	5	1	Hillsdale county: Moscow township (Oct. 30–Dec. 15.)	1	0			
Hillsdale county: Ransom township	*	....	Hillsdale county: Jefferson township (Sept. 17–Sept. 25.)	1	0			
Houghton county: Calumet township (Feb.–1900.)	63	4	Keweenaw county: Allouez township (May 10–June 2.)	1	0			
Houghton county: Lake Linden village (Mar. 13——.)	1	0	Houghton county: Franklin township (July 16–July 27.)	4	2			
Houghton county: Quincy township (Oct. 1–Nov. 20.)	4	0	Houghton county: Hancock village (Dec. 26——.)	1	0			
Houghton county: Red Jacket village (Sept.–Dec. 12.)	22	2	Keweenaw county: Allouez township (Oct. 3–Dec. 9.)	9	1			
Huron county: Fair Haven township (Jan.–Mar. 1.)	11	1	Huron county: Sebewaing township (Jan. 20–July 15.)	14	1			
Ingham county: Lansing city (Sept. 16–Dec.)	23	0	Shiawassee county: Woodhull township (Nov. 15–Jan., 1900.)	8	1			
Ingham county: Leslie township (Feb. 11–Feb. 25.)	1	0	Jackson county: Rives township	7	0			
Ingham county: Leslie village (——Aug. 27.)	57	1	Jackson county: Henrietta township (June 9–June 23.)	1	0			
Ingham county: Onondaga township	*	....	Jackson county: Rives township (May 12–June 1.)	2	0			
Ionia county: Ionia city	3	0	Ingham county: Mason city (Jan. 7–Jan. 17.)	2	0	Ingham county: Le Roy township (Jan. 23–Feb. 6.)	3	0
			Ionia county: Ronald township (Jan. 6–Jan. 31.)	4	0			
Ionia county: Lake Odessa	*	....	Barry county: Assyria township (Jan. 10–Feb. 5.)	3	1			
Isabella county	....	....	Newaygo county: Fremont village (Jan.–Feb.)	1	0			
Jackson county: Jackson city (Feb. 8–Nov. 19.)	20	0	Jackson county: Blackman township (Apr. 2–Apr. 30.)	2	0			
			Tompkins township (May 25–June 20.)	6	0			
			Washtenaw county: Lima township (Mar. 26–Apr. 20.)	1	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Kalamazoo county: Augusta village (Sept. 17-Jan. 11, 1900.)	45	10	Kalamazoo county: Galesburg village (Oct. 13-Nov. 6.)	1	0			
			Ross township (Sept. 19-Jan. 5, 1900.)	15	0			
Kalamazoo county: Kalamazoo city (Jan. 7-Dec. 30.)	46	1	Kalamazoo county: Charleston township (Nov. 17-Jan. 22, 1900.)	7	0			
			Richland township (Oct.-Dec. 3.)	4	0			
			Van Buren county: Geneva township (Oct. 22-Nov. 11.)	2	0			
Kent county: Alpine township (June 24-July 31.)	10	2	Kent county: Walker township (Sept. 17-Oct. 20.)	5	0			
Kent county: Bowne township (Oct. 29-Nov. 8.)	2	0	Kent county; Cascade township (Sept. 11-Oct. 10.)	1	0			
Kent county: Courtland township (May 13-June 8.)	4	0	Kent county: Cannon township (Aug.-Nov. 10.)	5	0			
			Cedar Springs village (May-June.)	3	0			
			Grattan township (June 9-June 20.)	4	0			
Kent county: Grand Rapids city (Jan. 1-Dec. 31.)	91	3	Ionia county: Campbell township (Aug. 4-Aug. 21.)	1	0	Kent county: Lowell township† (Sept. 23-Oct. 5.)	2	0
			Cascade township (Oct. 4-May 12, 1900.)	22	0			
			Rockford village (Jan. 24-July 16.)	12	0			
Kent county: Oakfield township (Mar. 12-Apr. 6.)	2	0	Ionia county: Belding city (May 13-June 7.)	2	0			
Lenawee county: Adrian city (Jan. 20-Jan. 2, 1900.)	27	0	Lenawee county: Fairfield township (Nov. 29-Mar. 10, 1900.)	3	0			
			Rome township (Sept. 5-Feb. 17, 1900.)	22	0	Lenawee county: Franklin township (Feb. 1-Mar. 16.)	7	0
			Tecumseh village (Oct. 15-Nov. 5.)	2	0			
Lenawee county: Medina township	*	....	Lenawee county: Seneca township (Oct. 15-Nov. 17.)	4	0			
Lenawee county: Palmyra township (Jan. 18-Feb. 28.)	5	0	Lenawee county: Blissfield village (Jan.——.)	6	0			
Lenawee county: Raisin township	*	....	Lenawee county: Adrian township (Dec. 9-Jan., 1900.)	2	0			
Macomb county: Richmond township (Sept. 20-Oct. 26.)	6	0	Macomb county: Memphis village (Sept. 30-May 12, 1900.)	24	1			
Manistee county: Manistee city (May-June.)	6	0	Kalkaska county: Kalkaska village	1	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

†From Lowell Township, Kent County (two cases), spread to Cascade Township, Kent County, one case.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Missaukee county: Lake City village ...... (Feb. 17–Mar. 6.)	10	1	Kalkaska county: Springfield township..	1	0			
Montcalm county: Crystal township....... (Nov. 16–Dec. 30.)	2	0	Montcalm county: Evergreen township...	1	0			
Montcalm county: Douglas township......	*	....	Montcalm county: Day township.......... (Mar. 9–Apr. 6.)	2	0			
Muskegon county: Muskegon city......... (Jan. 1–June.)	10	0	Muskegon county: Muskegon Heights vil. (Jan. 14–Mar. 29.)	4	0			
Newaygo county: Beaver township....... (May 20–July 24.)	5	0	Newaygo county: Troy township .... (June–Aug.)	7	0			
Newaygo county: Ensley township .... (Aug.–Sept.)	8	0	Kent county: Cedar Springs village . (Aug.–Sept. 9.)	2	0			
			Sand Lake village..... (Sept. 17–Oct. 14.)	3	0			
			Montcalm county: Pierson township...... (Nov. 8–Jan. 10, 1900.)	7	1			
Newaygo county: Hesperia village	*	....	Newaygo county: White Cloud village... (Apr. 2–May 3.)	4	0			
Oakland county: Birmingham village...	*	....	Oakland county: Southfield township... (Oct. 15–Nov. 14.)	2	0			
Osceola county: Evart village...........	*	....	Isabella county: Coldwater township ... (Nov. 26–Dec. 28.)	1	0			
Osceola county: Lincoln township...... (Mar. 2–Mar. 8.)	1	1	Lake county: Luther village......... (Mar. 27–Apr. 6.)	1	0			
Oscoda county: Big Creek township.... (Nov. 8–Dec. 3.)	3	0	Oscoda county: Elmer township .... (Nov. 15–Dec. 20.)	6	1			
Otsego county: Elmira township....... (Dec. 10–Mar. 21, 1900)	20	0	Antrim county: Warner township...... (Dec. 17–Apr. 1, 1900.)	11	2			
			Charlevoix county: Bay township.......... (Dec.–Feb., 1900.)	33	0			
Otsego county: Gaylord village .... (Apr. 10–Jan., 1900.)	34	1	Otsego county: Otsego Lake township. (Sept. 9–Nov. 8.)	2	1			
Sanilac county: Croswell village........	*	....	Sanilac county: Lexington village..... (Apr. 20–Jan. 22, 1900.)	13	0			
Sanilac county: Lexington village......	*	....	Sanilac county: Croswell village .... (Jan. 1–Jan. 10.)	1	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Schoolcraft county: Manistique village (Oct.-Nov.)	2	0	Delta county: Sack Bay township (Oct.-Oct.)	7	0			
St. Clair county: Marine City (Jan. 14-May 25.)	20	2	St. Clair county: Cottrellville township (Jan.-Mar. 1.)	8	0			
St. Clair county: Capac village	*	....	Lapeer county: Imlay township (May-June.)	5	0			
St. Joseph county: Three Rivers city	*	....	St. Joseph county: Burr Oak village (Jan. 23-Feb. 3.)	1	0			
St. Joseph county	....	....	Cass county: Volinia township (Jan. 6-Mar. 6.)	1	0			
Tuscola county: Akron township (Oct. 9-Jan. 6, 1900.)	3	0	Tuscola county: Fair Grove township (Oct. 18-Dec. 7.)	4	0			
Tuscola county: Elkland township	*	....	Sanilac county: Greenleaf township (Jan. 7-Feb. 1.)	3	1			
Tuscola county: Fremont township (Aug. 1-Aug. 26.)	1	0	Tuscola county: Mayville village (Aug. 10-Dec. 30.)	11	1			
Van Buren county: Bangor village (May 12-July 30.)	3	1	Van Buren county: Breedsville village (July 25-Aug. 3.)	1	0			
			Geneva township (Aug. 16-Aug. 26.)	1	0			
Washtenaw county: Ann Arbor city (Aug. 23-Oct.)	7	0	Washtenaw county: Dexter village (Aug. 11-Jan. 23, 1900.)	19	1	Livingston county: Putnam township (Sept.-Sept.)	3	0
						Washtenaw county: Scio township (Dec. 4-Feb. 5, 1900.)	4	0
						Sylvan township (Sept. 2-Dec. 18.)	3	0
Washtenaw county: Chelsea village (Oct. 1-Feb., 1900.)	11	0	Washtenaw county: Sylvan township (Nov. 28-Dec. 8.)	3	0			
Washtenaw county: Freedom township (Jan. 18-June.)	21	1	Washtenaw county: Sylvan township	13	0			
Wayne county: Detroit city (Jan. 1-Dec. 31.)	345	14	Cass county: Wayne township (Jan.-Feb.)	3	0			
			Monroe county: Petersburg village (July 18-July 24.)	1	0	Lenawee county: Blissfield village	1	0
			Oakland county: Orion village (Aug. 6-Sept. 4.)	1	0			
			Troy township (Sept. 16-Nov. 30.)	10	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Wayne county—*Con.*: Detroit city (Jan. 1-Dec. 31.)	345	14	St. Clair county: Marine City (July 29-Jan. 27, 1900.).	8	1	St. Clair county: St. Clair city (Sept. 18-Oct. 18.)	1	0
			Wales township (Oct. 8-Oct. 23.)	1	0			
			Wayne county: Redford township (Jan. 29-Feb. 12.)	1	0			
Wayne county: Ecorse township Apr. 6-Mar. 6, 1900.)	141	7	Monroe county: Berlin township (June 26-Aug. 16.)	1	0			
Wexford county: Cadillac city (Jan.-Jan. 30, 1900.)	54	2	Osceola county: Sherman township (Nov.-Dec. 1.)	3	0			
Wexford county: Manton village (Dec. 19-Dec.)	1	0	Kalkaska county: Orange township	1	0			
Movement of infection of scarlet fever **into Michigan** from outside the State.								
Canada	....	....	Cass county: Dowagiac city (June 20-July 15.)	2	0			
			Macomb county: Chesterfield township. (Jan. 12-Feb. 3.)	2	0			
			Saginaw county: Marion township (Nov. 21-Dec. 10.)	7	0			
			St. Clair county: Cottrellville township. (Oct. 23-Nov. 9.)	1	0			
Chicago	....	....	Berrien county: Stevensville village Apr. 6-Apr. 26.)	5	0			
			Calhoun county: Battle Creek city (Mar. 8-Apr. 4.)	2	0			
			Van Buren county: Antwerp township (Oct. 20.——.)	1	0			
			Van Buren county: Paw Paw village (July 1-July 28.)	1	0			
Ohio: Sylvania	....	....	Lenawee county: Blissfield village (Nov. 18-Dec. 8.)	1	0			
Ohio: Toledo	....	....	Gratiot county: Ashley village (Aug. 9-Dec. 4.)	10	0	Ionia county: Belding city Shiawassee county: Owosso city† (Sept. 24-Dec. 12.)	1 6	0 0
			Isabella county: Shepherd village (Nov. 4-Dec. 7.)	1	1			

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†From Owosso city, Shiawassee County, six cases, spread to Victor Township, Clinton County, one case.

EXHIBIT 2.—CONTINUED.—*Movement of infection of scarlet fever* **into Michigan** *from outside the State.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Ohio—*Continued:* Toledo	....	....	Monroe county: Whiteford township (Oct. 6–Feb. 12, 1900.)	24	1			
Ohio	....	....	Lenawee county: Cambridge township (Aug.–Dec. 28.)	14	0			
Indiana: Valparaiso	....	....	Berrien county: Lincoln township (Dec. 7–Dec. 30.)	1	0			
New York: Lockport	....	....	Tuscola county: Dayton township (Aug. 15–Oct. 12.)	1	0			
Wisconsin: LaPere	....	....	Gogebic county: Ironwood city (Aug. 11–Aug. 28.)	1	0			
Pennsylvania: Philadelphia	....	....	Barry county: Nashville village (Feb. 27–Mar. 20.)	1	0			
Wisconsin: Milwaukee	....	....	Marquette county: Michigamme township (Sept. 16–Nov. 14.)	4	0			
Probable movement of infection of scarlet fever.								
Bay county: Bay City (Jan. 1–Dec. 31.)	225	5	Bay county: Merritt township (Nov. 17–Nov. 21.)	1	1			
Benzie county: Homestead township (July 28–Aug. 31.)	5	1	Benzie county: Benzonia village (Oct.–Nov. 15.)	1	0			
Calhoun county: Battle Creek city (Jan. 3–Dec.)	85	1	Calhoun county: Bedford township (July 18–Jan., 1900.)	6	0			
Clare county: Clare city	*	...	Isabella county: Wise township (Feb. 13–May 5.)	36	0			
Hillsdale county: Hillsdale city (Sept. 6–Oct. 25.)	5	1	Hillsdale county: Hillsdale township (Nov. 12–Dec. 25.)	5	0			
Huron county	....	....	Sanilac county: Marion township (Mar. 7–Mar. 25.)	3	0			
Ingham county: Lansing city (Nov. 25–Dec. 31.)	23	0	Ingham county: Meridian township (Nov. 25–Dec. 18.)	1	0			
Ingham county: Lansing township (Sept. 1–Jan., 1900.)	8	0	Ingham county: Meridian township (Dec. 3.–Dec. 20.)	1	0			
Jackson county: Spring Arbor township (Dec. 27–Jan. 8, 1900.)	1	0	Jackson county: Hanover township (July 17–Aug. 8.)	2	0			
Kent county: Rockford village	12	0	Kent county: Plainfield township (Jan. 1–Mar. 18.)	51	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

EXHIBIT 2.—CONTINUED.—**Probable** *movement of infection of scarlet fever.*

First localities from which scarlet fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Macomb county: Washington township.. (Mt. Vernon.)	*	....	Oakland county: Addison township..... (Mar. 8–Mar. 30.)	4	0			
Monroe county; Exeter township....... (Sept. 26–Oct. 15.)	3	0	Wayne county: Sumpter township..... (Oct. 5–Oct. 12.)	1	1			
Monroe county: Whiteford township.... (Jan. 24–Sept. 20.)	24	0	Monroe county: Bedford township ..... (Mar. 15–Jan. 8, 1900.)	20	1			
Otsego county: Gaylord village .... (April 10–Jan., 1900.)	34	1	Otsego county: Elmira township....... (Dec. 10–Mar. 21, 1900.)	20	0			
			Livingston township... (Sept. 7–Nov.)	5	0			
St. Clair county: Port Huron city........ (June 3, 1900.)	31	0	St. Clair county: Clyde township........ (Oct. 27–Nov. 20.)	1	0			
			Macomb county: Richmond township... (Sept. 20–Oct. 26.)	6	0			
Tuscola county: Caro village............ (Dec.–Jan., 1900.)	3	1	Tuscola county: Fremont township..... (Aug. 1–Aug. 26.)	1	0			
Tuscola county: Mayville village........ (Aug. 10–Dec. 30.)	11	1	Lapeer county: Rich township .... (Nov. 14–Dec. 16.)	3	0			
Van Buren county: Bangor village......... (May 12–July 30.)	3	1	Van Buren county: Breedsville township..	1	0			
Wayne county: Detroit city............. (Jan. 1–Dec. 31.)	345	14	Huron county: Sebewaing village..... (Dec.–Feb. 13, 1900.)	13	1			
			Wayne county: Springwells township.. (Mar. 28–May 16.)	3	0			
Wayne county: Wyandotte city......... (Sept. 5–Nov. 18.)	5	0	Wayne county: Taylor township .... (Oct. 15–Nov. 22.)	2	0			
Wexford county: Cadillac city............ (Jan.–1900.)	54	2	Wexford county: Cedar Creek township. (Jan. 11–Feb. 7.)	8	0			
Probable movement of infection of scarlet fever **into Michigan** from outside the State.								
Chicago..................	....	....	Calhoun county: LeRoy township....... (Nov. 7–Nov.)	4	0			
Indiana..................	....	....	Allegan county: Casco township........ (Mar. 18–June 20.)	10	0			
Ohio.....................	....	....	Lenawee county: Morenci village........ (Mar. 4–May 3.)	2	0			
Washington (State).....	....	....	Grand Traverse county: Fife Lake village...... (Sept. 2–Sept. 13.)	1	0			

*This foot-note is printed at the bottom of the first page of this exhibit.

Estimated number of cases of scarlet fever prevented, and number of lives saved, by isolation and disinfection.—Tables 5 and 6 and the accompanying diagram compare the average numbers of cases and deaths in outbreaks of scarlet fever where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in those outbreaks where those measures were neglected.* By Table 6 it may be seen that during the thirteen years, 1887-99, there were over five times as many cases and deaths in those outbreaks in which these measures were neglected as in those outbreaks in which they were enforced.

By Table 5 it may be seen that during the year 1899 there were reported to the office of the State Board of Health 611 outbreaks of scarlet fever, with 3,531 cases and 148 deaths.† Had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 7,075 cases and 354 deaths, and taking from these respectively the cases (3,531) and deaths (148), which did occur, leaves 3,544 cases and 206 deaths indicated as prevented in these 611 outbreaks, by isolation and disinfection. By the same method for each year the indicated saving in the 6,374 outbreaks which occurred during the thirteen years, 1887-99, is 37,197 cases and 1,368 lives. This is shown in Table 6.

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*In the compilation of the reports for Tables 5 and 6 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate and disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed "Isolation and disinfection enforced." If, however, he neglects to properly isolate and disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

†*Definition of outbreak.*—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area. Also, comparisons of *years* require that outbreaks be counted as closed, at the end of the *year;* while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks,* even where they extend from one year into the next. This explains any apparent discrepancy between the numbers of outbreaks, cases and deaths here given and the numbers given at the beginning of this article.

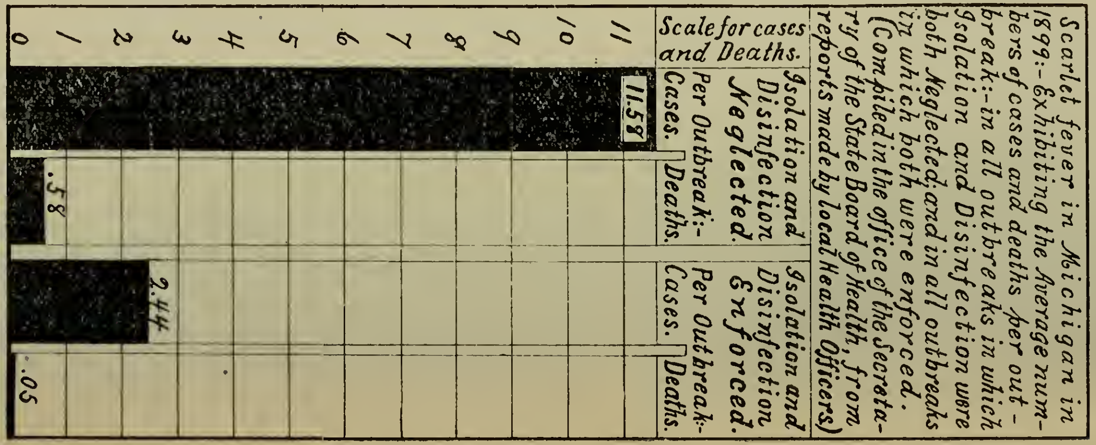
TABLE 5.—SCARLET FEVER IN MICHIGAN IN 1899: *Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 611 outbreaks reported; (2) in the 202 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 17 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 47 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 44 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 60 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 108 outbreaks in which isolation and disinfection were both neglected; (8) in the 133 outbreaks in which isolation and disinfection were both enforced.*

	(1) All outbreaks. (611 outbreaks.)*		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (202 outbreaks.)		(3) Disinfection enforced —isolation doubtful. (17 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (47 outbreaks.)		(5) Disinfection enforced —isolation neglected. (44 outbreaks.)		(6) Isolation enforced—disinfection neglected. (60 outbreaks.)		(7) Isolation and disinfection both neglected. (108 outbreaks.)		(8) Isolation and disinfection both enforced. (133 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	3,531	148	1,315	52	80	3	151	3	276	14	133	6	1,251	63	325	7
Averages.	5.78	.24	6.51	.26	4.71	.18	3.21	.06	6.27	.32	2.22	.10	†11.58	†.58	†2.44	†.05

*These do not include the cases and deaths in Detroit, Grand Rapids, Lansing, Bay City, Kalamazoo, Port Huron, Battle Creek, Dowagiac, and Calumet and Osceola townships, because of the difficulty in determining the beginning and ending of an outbreak in these cities or townships, in which the disease was present in some part of the city or township nearly all the time.

†These figures are graphically represented in the diagram on this page, entitled "Isolation and disinfection restrict scarlet fever."

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.



This diagram graphically represents the lower line of figures in the last four columns of table 5.

[PLATE 1061.]

TABLE 6.—Scarlet Fever.—*Exhibiting for the 13 years, and for each of the 13 years 1887-99, the numbers of reported outbreaks, cases and deaths; also for this 13-year period, the average numbers of cases and deaths per outbreak in all outbreaks; in those outbreaks in which isolation or disinfection or both were doubtful; isolation and disinfection both neglected; isolation and disinfection both enforced; and, also, the numbers of cases and deaths indicated as having been prevented by isolation and disinfection.*

Years.	*All outbreaks.			Isolation or disinfection, or both, not mentioned, or statements doubtful.			Isolation and disinfection both neglected.			Isolation and disinfection both enforced.			Cases and deaths indicated as having been prevented by isolation and disinfection.	
	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Cases.	Deaths.
1887	299	1,882	141	190	1,200	93	32	440	34	64	148	11	† 2,220	177
1888	340	1,838	112	225	955	74	61	724	33	36	80	3	† 2,198	† 72
1889	417	2,822	123	284	1,453	61	72	1,208	48	52	140	10	† 4,175	† 156
1890	477	3,054	115	302	1,711	67	94	1,137	36	42	76	1	† 2,718	† 66
1891	602	4,936	193	380	3,012	91	141	1,704	66	42	107	1	† 2,342	† 90
1892	622	5,240	306	377	2,944	188	110	1,621	59	42	97	7	† 3,928	† 30
1893	667	5,219	327	387	3,197	204	124	1,511	99	60	157	8	† 2,912	† 207
1894	662	4,349	175	378	2,366	93	104	1,348	42	74	187	9	† 4,231	† 90
1895	555	2,905	85	275	1,259	42	82	1,138	27	92	162	4	† 4,798	† 98
1896	389	1,534	42	148	485	15	80	681	16	78	153	4	† 1,776	† 36
1897	336	1,531	52	130	654	21	63	427	17	59	127	5	† 747	† 39
1898	397	1,759	74	140	645	24	52	441	23	88	202	6	† 1,608	† 101
1899	611	3,531	148	202	1,315	52	108	1,251	63	133	325	7	† 3,544	† 206
Totals	6,374	40,600	1,893	3,418	21,196	1,025	1,123	13,631	563	862	1,961	76	‡37,197 ‡36,780	‡ 1,368 ‡ 1,294
Averages, 13 years	490	3,123	146	263	1,630	79	86	1,049	43	66	151	6	2,862	105
Average cases and deaths per outbreak for thirteen years, 1887-99	....	6.37	.30	....	6.20	.30	....	12.14	.50	....	2.27	.09	....	....

*Outbreaks in Detroit, Grand Rapids and a few other localities, where the disease was present throughout the whole year, are not included, owing to the difficulty in determining the beginning and ending of an outbreak in those localities. The localities which are thus excluded in 1899, are given in a foot-note to Table 5 of this article; and for previous years, in foot-notes to similar tables in articles on scarlet fever for those years.

†The numbers of cases and deaths in this double column are found by multiplying "all outbreaks" for each year by the average numbers of cases or deaths per outbreak, in those outbreaks in which isolation and disinfection were both neglected, for that year, and deducting from the results thus obtained, the cases or deaths, as the case may be, which were reported to have occurred that year. ‡The two sets of numbers appearing in this column are based on two distinct methods of solution which are explained as follows:—(1) The 37,197 cases and 1,368 deaths are totals of the columns representing cases and deaths saved as explained in the † foot-note, (2) the 36,780 cases and 1.294 deaths are obtained by multiplying the average number of cases and deaths per outbreak for the thirteen years, 1887-99 (12.14 and .50, where isolation and disinfection were neglected) by the total number of outbreaks, to find the numbers which would have occurred if all outbreaks had been neglected, and subtracting therefrom the numbers of cases and deaths that were reported as having occurred during the thirteen-year period.

Period of incubation, in scarlet fever.—The average period of incubation in the 142 reported instances is 8.7 days; the greatest number of instances given in any single period was in the seven-day period.

TABLE 7.—*Exhibiting the reported period of incubation, stated in days, in 142 instances of scarlet fever. Compiled from reports of health officers in Michigan, for the year 1899.*

Incubation period—days	1	2	3	4	5	6	7	8	9	10	11	12	14	16	17	20	21
Instances in each period	1	5	*8	†12	‡10	§13	¶24	‖7	**10	††16	‡‡3	§§3	¶¶17	3	2	‖‖2	***6

*In one of these instances, reported as about 3 days. †In 2 of these instances reported as about 4 days. ‡In 6 of these instances, reported as about 5 days. §In 3 of these instances, reported as about 6 days. ¶In 4 of these instances, reported as about 7 days. ‖In 3 of these instances, reported as about 8 days. ** In 4 of these instances, reported as about 9 days. ††In 7 of these instances, reported as about 10 days. ‡‡In 1 instance, reported as about 11 days. §§In 3 of these instances, reported as about 12 days. ¶¶In 5 of these instances, reported as about 14 days. ‖‖In 1 instance, reported as about 20 days. ***In 1 instance, reported as about 21 days.

Ages of greatest prevalence of, and mortality from, scarlet fever.—Of the total numbers of cases and deaths reported to this office for the year 1899, the number of deaths per 100 cases was 3.9; and in the smaller numbers of cases and deaths of which the ages were stated, the number of deaths per 100 cases was 5.1; of the 4,345 cases of scarlet fever reported, of which 171 were fatal cases, the ages were stated for 2,782 cases, 143 of these being fatal cases.

TABLE 8.—*Exhibiting in certain age-groups, the numbers of cases and deaths from scarlet fever; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; and the per cent that the deaths in each group were of the cases in that group.—Compiled from all reports for the year 1899, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.																		
Ages in groups of years	All ages known.	0–1.	1–2.	2–3.	3–4.	4–5.	0–5.	5–9.	10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	Over 60.
No. of cases*	2,782	38	90	165	191	240	724	1,166	596	147	57	44	24	13	9	0	1	0	1
Per cent the cases in each group were of all cases	....	1.4	3.2	5.9	6.9	8.6	26.0	41.9	21.4	5.3	2.0	1.6	.9	.5	.3	0	.04	0	.04
No. of deaths	143	10	18	22	22	9	81	43	12	4	1	0	2	0	0	0	0	0	0
Per cent the deaths in each group were of cases in that group	5.1	26.3	20.0	13.3	11.5	3.8	11.2	3.7	2.0	2.7	1.8	0	8.3	0	0	0	0	0	0
Per cent the deaths in each group were of all deaths	....	7.0	12.6	15.4	15.4	6.3	56.6	30.1	8.4	2.8	.7	0	1.4	0	0	0	0	0	0
Per cent the deaths in special groups were of all deaths	....	56.6					86.7		8.4	4.9					0				

*Does not include those cases or deaths where the age was not stated.

Table 8 shows that the fatality in children under five years of age was greater than in any other five-year age-period.

TABLE 9.—*Exhibiting in certain age-groups, the numbers of cases and deaths from scarlet fever in the year 1899, and in the seven years, 1892-98; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths. Compiled from all reports for the years 1892-99, which stated the ages.*

Year.		Total No. included.*	Per cent of cases and deaths in certain age-groups.										
			All ages.	0 to 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 years and over.
1899.	Cases	2,782	100	26.0	41.9	21.4	5.3	2.0	1.6	.9	.5	.3	.1
	Deaths	143	100	56.6	30.1	8.4	2.8	.7	0	1.4	0	0	0
1892-98.	Cases	15,706	100	32.8	40.5	16.6	5.3	2.0	1.2	.7	.5	.2	.1
	Deaths	704	100	56.4	28.3	9.9	2.8	1.4	.3	.4	.1	.3	.0

*In this column *cases* include both *fatal* and *non-fatal* cases.

TABLE 10.—*Exhibiting, by sex, and in certain age-groups, the per cent of persons who died from scarlet fever in Michigan, during the year 1899, and the averages for the 6 years, 1893-98; also the average age at death, and the number of deaths included. (Compiled from such reports as stated the ages.)*

Deaths from scarlet fever.															
Year.	Sex.	Average age, years.	No. of deaths included.	Ages.—In periods of years. Per cent of deaths in each period of age.											
				All ages.	Under 5 years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Males	5.2	69	100	56.5	29.0	7.2	5.8	0	0	1.4	0	0	0	0
	Females	4.9	74	100	56.8	31.1	9.5	0	1.4	0	1.4	0	0	0	0
1893-98.	Males	5.4	276	100	54.7	33.3	6.9	2.9	1.1	.7	0	.4	0	0	0
	Females	6.3	300	100	50.0	29.3	13.3	4.7	1.7	.3	.3	0	.3	0	0

Table 9 shows that the greatest per cent of all cases of scarlet fever occurred in children from five to nine years of age, and the greatest per cent of all deaths was in children under five years of age, both for the year 1899 and for the seven years, 1892-98.

The average age of decedents for the six years, 1893-98, was 5.4 for males and 6.3 years for females. The average age of cases recovering from this disease for the six years was 19.1 years for each sex.

Average duration of scarlet fever. Fatal and non-fatal cases.—The average duration of fatal cases of scarlet fever for the year 1899 was 11.5 days for males and 14.1 days for females. For the six years, 1893-98 the average duration was 11.3 days for males and 9.8 for females.

TABLE 11.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from scarlet fever, in Michigan, during the year 1899, and the averages for the 6 years, 1893-98; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of non-fatal cases, years.	No. of cases included.	Age.—In periods of years. Per cent of (non-fatal) cases in each period of age.											
				All ages.	Under 5 years	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Males.....	7.8	1,229	100	27.4	44.5	20.3	3.9	1.4	1.2	.7	.4	.2	0	0
	Females..	9.2	1,410	100	21.7	40.9	23.8	6.7	2.8	2.1	.9	.6	.5	0	.1
1893-98.	Males.....	7.8	5,614	100	29.9	42.7	18.0	5.0	1.9	1.0	.6	.5	.2	.1	.1
	Females..	8.7	6,684	100	24.8	42.6	20.0	6.3	2.6	1.5	1.0	.7	.2	.1	.1

TABLE 12.—*Exhibiting, by sex of patient, by per cent of cases which died in specified periods of time, the duration (in days) of fatal cases of sickness from scarlet fever, in Michigan, during the year 1899, and the averages for the 6 years, 1893-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of scarlet fever.														
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period of days.											
			All periods.	0 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 days and over.
1899.	Males...........	46	100	30.4	34.8	8.7	13.0	4.3	4.3	0	2.2	0	0	2.2
	Females........	52	100	34.6	23.1	13.5	9.6	1.9	1.9	9.6	1.9	0	0	3.9
1893-98.	Males...........	195	100	38.5	25.1	14.9	5.1	6.7	2.6	2.6	1.5	1.0	0	2.1
	Females........	214	100	44.9	22.0	15.0	6.5	5.1	1.9	1.9	.5	1.9	0	.5

TABLE 13.—*Exhibiting, by sex of patient, by per cent of cases which recovered in specified periods of time, the duration (in days) of non-fatal cases of sickness from scarlet fever in Michigan, during the year 1899, and the averages for the 6 years, 1893-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of scarlet fever.														
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of non-fatal cases in each period of days.											
			All periods.	0 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	Over 50 days.
1899.	Males...........	1,182	100	3.2	16.3	17.8	17.2	14.6	12.7	5.9	4.5	2.9	1.4	3.6
	Females........	1,319	100	2.9	15.4	20.9	15.6	16.2	13.1	5.0	4.1	3.0	1.7	2.0
1893-98.	Males...........	3,391	100	3.7	19.3	21.7	17.0	14.7	10.0	5.7	3.3	2.5	1.3	.8
	Females........	3,934	100	3.4	18.4	22.3	17.5	14.6	10.7	6.1	3.1	2.4	.7	.9

RÖTHELN (GERMAN MEASLES) IN MICHIGAN IN 1899.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health fifty-four outbreaks of rötheln resulting in 695 cases. An increase of forty-four outbreaks and 589 cases as compared with 1898. This increase is probably more apparent than real, and due to the fact that health officers are more generally reporting rötheln, rather than to an actual increase in the prevalence of this disease.

The main reason for efforts for the restriction of rötheln is the fact that scarlet fever is so often mistaken for rötheln, so that in restricting what is apparently rötheln a more fatal disease is sometimes restricted.

In all cases the public health should be given the benefit of any doubt, and precaution taken against the spread of any contagious disease which may prove to be dangerous.

TYPHOID FEVER IN MICHIGAN.—DURING THE YEAR ENDING DECEMBER 31, 1899.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health 862 outbreaks of typhoid fever (includes "typho-malarial") in 679 localities in Michigan in which there were reported to have occurred 3,194 cases and 638 deaths. Notwithstanding the marked improvement which the State Board of Health has succeeded in bringing about both in promptness and accuracy of reports of local health officials to the central office, it is still probable that not all cases of sickness and deaths from typhoid fever are yet reported.

Definition of the term "outbreak," as used in this article.—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area.

TABLE 1.—TYPHOID FEVER.—*Exhibiting the numbers of outbreaks, localities, cases and deaths reported for the year 1899; also for the years 1886-98 the average reported outbreaks, localities, cases and deaths, and the average cases and deaths per outbreak, the deaths to 100 cases, and the number of special final reports received.*

Year.	Outbreaks reported.	Localities reported.	Cases reported.	Deaths reported.	Average cases per outbreak.	Average deaths per outbreak.	Deaths per 100 cases.	Final reports received.
1899.......	862	679	3,194	638	3.71	.74	20	746
Averages, 1886-98...	518	461	2,707	466	5.23	.90	17	250

Typhoid fever in 1899, compared with previous years.—Comparisons with previous years, to ascertain the comparative increase or decrease of the prevalence of typhoid fever in this State, are interesting and instructive, and they would be more so if there existed a fixed basis on which to found such comparisons; but from year to year there has been a steady improvement, both in the methods adopted by the State Board of Health

TABLE 2.—*Numbers of cases and deaths reported from typhoid fever, and the cases and deaths per 10,000 persons living in each county in Michigan during the year 1899. (Compiled from reports of health officers, etc.)*

State and counties.	Population of Michigan for 1899.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.
State	2,426,331	3,194	638	13.16	2.63
Alcona	5,429	4	0	7.37	0
Alger	1,569	0	0	0	0
Allegan	39,474	34	5	8.61	1.27
Alpena	20,387	20	10	9.81	4.91
Antrim	14,943	23	2	15.39	1.34
Arenac	8,518	11	0	12.91	0
Baraga	5,727	36	10	62.86	17.46
Barry	23,594	27	5	11.44	2.12
Bay	67,419	69	24	10.23	3.56
Benzie	11,596	6	0	5.17	0
Berrien	51,073	55	8	10.77	1.57
Branch	25,477	26	4	10.21	1.57
Calhoun	52,436	74	17	14.11	3.24
Cass	21,455	19	7	8.86	3.26
Charlevoix	12,637	7	4	5.54	3.16
Cheboygan	16,293	8	2	4.91	1.23
Chippewa	19,451	39	10	20.05	5.14
Clare	8,499	5	2	5.88	2.35
Clinton	25,953	38	8	14.64	3.08
Crawford	2,395	0	0	0	0
Delta	24,177	58	10	23.99	4.14
Dickinson	15,635	6	2	3.84	1.28
Eaton	33,273	151	17	45.38	5.11
Emmet	13,045	18	3	13.80	2.30
Genesee	41,957	33	9	7.87	2.15
Gladwin	5,765	2	0	3.47	0
Gogebic	15,229	22	4	14.45	2.61
Gd. Traverse	22,715	22	9	9.69	3.96
Gratiot	28,911	43	9	14.87	3.11
Hillsdale	29,787	16	2	5.37	.67
Houghton	55,124	66	17	11.97	3.08
Huron	36,895	19	3	5.15	.81
Ingham	42,218	123	18	29.13	4.26
Ionia	37,344	30	5	8.03	1.34
Iosco	8,735	6	3	6.87	3.43
Iron	5,628	2	0	3.55	0
Isabella	24,758	28	5	11.31	2.02
Jackson	48,415	96	11	19.83	2.27
Kalamazoo	45,535	51	7	11.20	1.54
Kalkaska	6,240	9	2	14.42	3.21
Kent	136,958	243	45	17.74	3.29
Keweenaw	2,829	1	0	3.53	0
Lake	5,137	3	1	5.84	1.95
Lapeer	28,460	51	6	17.92	2.11
Leelanau	11,310	5	4	4.42	3.54
Lenawee	48,657	47	12	9.66	2.47
Livingston	19,911	5	1	2.51	0.50
Luce	2,214	1	0	4.52	0
Mackinac	6,496	4	0	6.16	0
Macomb	34,105	62	11	18.18	3.23
Manistee	28,469	22	6	7.73	2.11
Marquette	40,418	65	10	16.08	2.47
Mason	20,968	19	5	9.06	2.38
Mecosta	22,019	29	8	13.17	3.63
Menominee	25,248	304	34	120.41	13.47
Midland	16,419	28	8	17.05	4.87
Missaukee	9,339	20	4	21.42	4.28
Monroe	34,236	57	12	10.81	3.51
Montcalm	36,059	47	16	13.03	4.44
Montmorency	3,627	1	0	2.76	0
Muskegon	33,963	32	9	9.42	2.65
Newaygo	17,436	25	9	14.34	5.16
Oakland	44,465	23	5	5.17	1.12
Oceana	17,725	29	5	16.36	2.82
Ogemaw	5,707	2	0	3.50	0
Ontonagon	10,769	8	0	7.43	0
Osceola	18,781	17	4	9.05	2.13
Oscoda	1,683	0	0	0	0
Otsego	5,447	28	5	51.40	9.18
Ottawa	43,739	29	7	6.63	1.60
Presque Isle	7,441	2	0	2.69	0
Roscommon	1,187	0	0	0	0
Saginaw	81,314	95	19	11.68	2.34
Sanilac	35,640	45	10	12.63	2.81
Schoolcraft	8,763	2	1	2.28	1.14
Shiawassee	35,232	40	9	11.35	2.55
St. Clair	57,091	73	11	12.79	1.93
St. Joseph	24,751	30	6	12.12	2.42
Tuscola	36,792	70	6	19.03	1.63
Van Buren	31,707	25	7	7.88	2.21
Washtenaw	45,133	67	15	14.84	3.32
Wayne	336,645	213	69	6.33	2.05
Wexford	17,508	23	4	13.14	2.28

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894. Computed in the office of the State Board of Health.

in securing and compiling reports, and in the efforts made by the local health officials throughout the State, to furnish in their reports the information desired by the State Board. It is, therefore, still impossible to determine the exact increase or decrease of prevalence of the disease in this State by comparisons of the numbers of outbreaks of the disease, and the cases and deaths reported to this office year by year.

The facts exhibited in Table 1, show that the reported outbreaks, cases of sickness, and deaths from typhoid fever in 1899, exceed the averages for the thirteen years, 1886-98; also that the numbers of deaths per 100 cases and the final reports received relative to typhoid fever were *more*, and that the cases and deaths per outbreak were *less* than the averages for the years 1886-98.

Sickness-rates from reported typhoid fever in 1899.—While it is probable that the reporting of cases of sickness from typhoid fever is not as complete as the reporting of deaths from that disease, yet comparisons may be made, subject to a mental reservation that not all cases are reported, and that it is probable that the omissions are greater in some parts of the State than in others.

Table 2 shows that the sickness-rate from typhoid fever for the State in 1899 was 13.16 cases per 10,000 of population. The county having the greatest reported sickness-rate (120.41) per 10,000 inhabitants, was Menominee; and the lowest (where sickness occurred) was in Schoolcraft County, where the rate was 2.28 cases per 10,000 of population.

Death-rates from reported typhoid fever in 1899.—Table 2 shows that the death-rate from reported typhoid fever in 1899, for the State, was 2.63 per 10,000 of population. The county having the highest death-rate (17.46) was Baraga, and that having the lowest (where deaths occurred), .67 of one death per 10,000 of population, was Hillsdale.

Typhoid fever in each month of the year 1899.—The last line in Table 3 shows the number of outbreaks present in each month of the year. As many outbreaks lasted more than one month they are counted in each month of their duration; consequently the sum of the outbreaks present in the several months exceeds the total number of reported outbreaks.

TABLE 3.—*Exhibiting the number of outbreaks of typhoid fever reported to have begun, to have ended, and to have been present, in each month of the year 1899, in Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Outbreaks began..	30	28	27	22	27	60	64	130	156	124	56	40	764
Outbreaks ended..	10	22	37	28	23	23	41	57	90	138	125	115	709
Outbreaks present	54	74	85	72	73	112	155	240	341	370	286	203	....

TABLE 4.—*Exhibiting the number and per cent of cases of typhoid fever in Michigan in each month during the year 1899. (Includes each case for which the time during which it existed, was stated in reports. Each of such cases is counted in each month in which, or part of which, the case was reported to have existed.)*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases sick in any part of the month..	76	105	138	119	145	210	313	414	741	760	547	337
Per cent the cases sick in each month were of total reported cases.....	2	3	4	4	5	7	10	13	23	24	17	10

The first line of figures in Table 4 shows the number of cases reported sick in any part of each month. As some of the cases were sick longer than one month, they are included in the cases sick in more than one month, therefore the sum of the cases sick in all the months exceeds the total of reported cases in 1899; and as the last line of figures in this table shows the per cent the cases sick in each month were of the exact number of cases *reported* to this office in 1899, the sum of the figures in the last line of the table exceeds 100.

Source of contagium of typhoid fever.—Of the 3,194 reported cases of typhoid fever in 1899, the local health officers stated the source of contagium to be as follows:

Traced to former cases, 33; attributed to infected, contaminated, or surface water, 1,083; cases reported as coming from outside jurisdictions, 375; attributed to filthy or unsanitary conditions, 72; contaminated milk or food supply, 22; cases, the sources of contagium of which were reported as unknown, 826; cases, the sources of contagium of which were not reported, or the statements were too indefinite for classification, 778; from flies, 3; from infected bedding, etc., 2; total, 3,194.

Extracts from correspondence of this office relative to contagium of typhoid fever.—Relative to an outbreak of typhoid fever in Irving Township, Barry County, the attending physician wrote:

> "Source of contagium of the outbreak was using cistern water for drinking purposes. By microscopic analysis I found typhoid fever germs in the cistern water."

The health officer of Nashville Village, Barry County, reported relative to the source of contagium in an outbreak of typhoid fever in his jurisdiction: "Probable cause, leaching of water from cellar into well."

Relative to an outbreak of typhoid fever in Blissfield Township, Lenawee County, the health officer wrote:

> "Drank water from an infected well. There were three cases in all, but the other two cases reside in Raisin Township. All cases came from one well. The patient that died visited the home in Raisin and drank the water for a few days. Died on the fourteenth day from perforation."

Typhoid fever believed to be spread by flies.—Relative to the source of contagium in an outbreak of typhoid fever in Rockland Township, Ontonagon County, the health officer writes:—

> "Contracted from a former case by means of flies."

The source of contagium in an outbreak of typhoid fever in Albee

Township, Saginaw County, was attributed by the health officer to contaminated water, as follows:—

> "I have to report three cases of typhoid fever in this township, all of which are improving at the present time. The physician said that the cause of the fever was stagnant water standing along the highway. The source of the water in the highway is from a coal mine. They pump the water from the mine and have constructed a ditch to carry the water from the mine to the highway, but have provided no outlet for the water from the highway."

Longevity of the typhoid germ.—Relative to the source of contagium in an outbreak of typhoid fever in Columbus Township, St. Clair County, the health officer wrote:—

> "We think from local causes. One person sick where typhoid fever had been previously. At the house near by two were sick with the disease, we think from the same local cause."

August 18, 1899, the township clerk wrote to the Secretary of this Board as follows relative to this outbreak:—

> "You remember Mrs. Graham, who lost her husband with typhoid fever last year; you remember, too, that she had the fever herself, also that their home is about the center of the fever community. Well, that same Mrs. Graham has the fever again.
>
> "Can you give us any suggestions as to ferreting out the cause? We will try not to let the fever spread."

In reply to the clerk's letter, August 25, 1899, the secretary wrote:—

> "Referring to your letter of August 18 relative to the sickness of Mrs. Nealie Graham with typhoid fever, it is possible that the infection may have come from the second residence from Mrs. Graham's, the one with the well whose water is so near the surface of the land and which is surrounded with manure, etc. It may be possible that the water in this well comes from the same stratum as the water in the other wells of the neighborhood, and if the stratum of water is contaminated all the wells about them (except the artesian wells) might be contaminated. Again, it may be possible that a garment infected with a few drops of urine or some excreta would be the source of infection. The urine is sometimes a pure culture of the Eberth bacillus. Again the infection might have come by means of a dish or pan having been washed in infected water. It has been often found that where milk cans were washed by water from creeks which were contaminated by the excreta or urine of persons sick with typhoid fever, this disease developed along those routes, notwithstanding that much care was used to keep up the sanitary conditions of the stables and milk room. Flies have been supposed to have contaminated food of the soldiers while in camp life during the late war, developing cases of typhoid fever where rigid sanitary rules were not enforced. Extending this idea, chickens and other fowls might bring the infection from contaminated places to wells on other premises where they go. The germs of typhoid fever are *generally* spread by contaminated water, often by infected milk, and sometimes, though rarely, by infected garments. To ascertain the cause of sickness of any one person, you can readily see the avenues must be thoroughly examined and facts sought, and often, as in this case, a most critical and very searching examination has to be made. During the instructive and interesting correspondence last year with Mrs. Graham, when the cause of the yearly outbreak in your vicinity was sought, it seemed impossible to get a grip on an absolute fact which might lead to a certain source solution for the outbreak there. This office would be greatly pleased to learn from whence this contagium comes, or from whence the source of infection arises, and if it is possible to obtain some clue or fact, to which we may extend our inquiry, we may develop a cause. I have suggested nearly all the means of communication of the infection, and I should be greatly pleased if, acting upon any of the suggestions, or reasonable conjectures relative to any, you can get some fact."

September 11, 1899, the clerk replied to the secretary's letter as follows:—

> "Our health officer and myself have studied all we could into the cause of the outbreak of the fever. Mrs. Graham had been very careful about her drinking water; she has boiled the same water that others have been drinking who did not get the fever, she has not been near the family above that you spoke of. We, the health officer and I, think the cause of the fever must be right at her home. Mrs. Graham is building a new house, she has a cellar being built under this new house. The place where the ground was dug up is where the excreta, from the husband who died, was buried. The man who dug this cellar and stoned it, he also boarded with Mrs. Graham, went home with typho-malarial fever. The house just above Mrs. Graham's, where the deep well is, has a case of typhoid fever. Do you think it possible that the germs would live in the ground through a severe winter—such as last winter? Mrs. Graham we think will recover."

The facts relative to the digging up of the ground where the excreta were buried may explain the source of this outbreak.

TABLE 5.—*First, second and third localities, where the second locality was infected with typhoid fever from the first, and the third was infected from the second; and the number of cases and deaths from typhoid fever in the first, second and third localities, with the dates of the beginning and ending of each outbreak. (Compiled from reports of health officers who were able to trace the source of the contagium to other localities.)*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Alger county: Munising	*	....	Antrim county: Jordan township (Oct.-Nov.)	1	0			
Allegan county: Allegan village	*	....	Kent county: Wyoming township (Dec. 25-Jan. 26, 1900.)	1	1			
Allegan county: Fennville village	*	....	Allegan county: Heath township (Sept. 10-Jan. 7, 1900.)	4	0			
Antrim county: Alba	*	....	Ionia county: Boston township (Oct. 8-Nov. 3.)	1	0			
Antrim county	....	....	Montcalm county: Pierson township (Dec. 20-June 15, 1900.)	6	1			
Arenac county: Omer	*	....	Huron county: Bad Axe village (Oct. 9-Dec. 24.)	2	1			
Baraga county: Baraga (village) (Mar. 1-Nov. 6.)	31	5	Marquette county: Marquette city (May 20-Jan. 25, 1900.)	35	8			
Bay county: Bay City (Feb.-Nov.)	51	1	Saginaw county: Kochville township (May 24-June 19.)	1	0			
Benzie county: Homestead township	*	....	Manistee county: Bear Lake village (Mar. 30-April 28.)	1	0			
Berrien county: New Buffalo (Aug.-Sept.)	2	0	Emmet county: Bear Creek township (Sept. 25-Oct. 10.)	1	1			
Branch county: Union City village	*	....	Branch county: Batavia township (Aug. 12-Oct. 20.)	1	0			
			Calhoun county: Athens village (June 25-July 13.)	1	1			
Calhoun county: Battle Creek city (Apr.-Dec.)	30	5	Calhoun county: Battle Creek township. (Oct. 12-Nov. 20.)	1	0			
			Kalamazoo county: Vicksburg village (June 27-Aug. 29.)	1	0			
			Tuscola county: Tuscola township (Aug. 2-Oct. 1.)	4	1			

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*Typhoid fever was not reported to this office by the health officer of the "first" locality at the time it was said to have spread from there: showing that the disease, if present, was neglected; probably it was not reported to the health officer as the law requires.

TABLE 5.—Continued.—*Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			**Second** localities infected from first.			**Third** localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Charlevoix county: Charlevoix village	1	0	Grand Traverse county: Traverse City	5	2	Gd. Traverse county: Peninsula township.	4	2
						Kent county: Byron township	1	0
Clinton county: Fowler village (June 30–Nov.)	2	0	Clinton county: Ovid township (Sept. 21–Jan., 1900.)	4	0			
Clinton county: St. Johns village (May 15–Aug. 10.)	6	2	Clinton county: Greenbush township (Sept. 28–Oct. 20.)	1	0			
			Ionia county: Ionia city (Aug. 24–Oct. 13.)	2	0			
Delta county	....	....	Charlevoix county: South Arm township (Oct. 28–Nov. 24.)	1	0			
Eaton county; Bellevue (Township)	2	2	Calhoun county: Clarendon township	1	0			
Eaton county: Bellevue village	*	....	Eaton county: Olivet village (June 29–July 13.)	1	1			
Eaton county: Eaton Rapids city	3	0	Jackson county: Columbia township (Oct. 28–Nov. 18.)	1	0			
Emmet county: Petoskey city (Aug. 10–Oct. 6.)	3	0	Clinton county: Ovid village (Sept. 30–Oct. 31.)	1	1			
			Emmet county: Harbor Springs village (Sept. 1–Dec. 12.)	5	0			
Genesee county: Flint city (Aug.–Dec. 30.)	12	3	Genesee county: Flushing township (Aug.–Oct. 1.)	6	1			
			Wayne county: Northville village (Dec. 4–Dec. 16.)	1	1			
			Wayne village (Dec. —)	1	1			
Gogebic county: Ironwood city (Jan.–Dec.)	20	4	Ontonagon county: Greenland township (Sept. 10–Oct. 20.)	1	0	Ontonagon county: Ontonagon village (Oct. 9 —)	1	0
Grand Traverse county	....	....	Mecosta county: Mecosta township (Nov. 25–Dec. 30.)	1	0			
Gratiot county: Alma village (Aug. 30–Jan. 11, 1900.)	10	2	Isabella county: Chippewa township (Sept. 24–Oct. 17.)	1	0			
Hillsdale county: Hillsdale city	5	0	Calhoun county: Clarendon township	1	0			
			Hillsdale county: Allen township	3	0			
Houghton county: Calumet township (June–Dec.)	19	7	Marquette county: Humboldt township (June 28–July 28.)	1	0			

*This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Huron county: Bloomfield township (Sept. 4-Sept. 16.)	1	1	Huron county: Colfax township (Nov. 4-Feb. 15, 1900.)	4	1			
Huron county: Rubicon township (Sept. 21-Oct. 3.)	1	1	Huron county: Huron township (Sept.-Oct. 30.)	1	0			
Ingham county: Mason city (June 15-Oct. 1.)	12	1	Ingham county: Aurelius township (Aug. 15-Aug. 29.)	1	0			
			Vevay township (Sept. 24-Oct. 20.)	1	0			
Ingham county: Meridian township (Haslett Park.) (Oct. 11-Feb. 5, 1900.)	8	2	Ingham county: Alaiedon township (Nov.-Jan. 10, 1900.)	1	0			
Ingham county: Stockbridge township (Sept. 2-Sept. 23.)	1	0	Ionia county: Belding city (Sept. 11-Oct.)	1	0			
Ingham county	....	....	Jackson county: Spring Arbor township (Sept. 13-Oct. 2.)	2	0			
Ionia county: Lyons township (July —.)	5	0	Clinton county: Greenbush township (July 3-Aug. 5.)	1	0			
Isabella county: Mt Pleasant city (Aug. 28-Dec. 30.)	6	1	Isabella county: Isabella township (Sept. 25-Oct. 18.)	1	0			
Mt. Pleasant city (Jan. 12-Feb. 4.)	1	1	Union township (Mar. 3-May 3.)	2	0			
Jackson county: Concord township (July 15-Aug. 21.)	1	0	Calhoun county: Albion city (July 22-Aug. 12.)	1	1			
Jackson county: Jackson city (Feb. 16-Dec. 30.)	52	10	Calhoun county: Albion city (July 12—.)	1	0			
			Jackson county: Columbia township (Aug. 26-Oct. 7.)	6	0			
			Washtenaw county: Ann Arbor city (—Sept. 19.)	1	1			
Kalkaska county: Boardman township	4	1	Leelanau county: Bingham township	1	1			
Kent county: Bowne township	*	....	Kent county: Caledonia township (Sept. 9-Oct. 15.)	1	0			
Kent county: Grand Rapids city (Jan.-Dec.)	202	33	Emmet county: Petoskey city (May 13-June 18.)	1	1			
			Hillsdale county: Somerset township (Oct. 24-Nov. 19.)	1	1			
			Jackson county: Columbia township (Oct. 5-Nov. 20.)	8	0			

*This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Kent county: Grand Rapids city..... (Jan.-Dec.)	202	33	Kent county: Algonac township..... (Sept. 24—.)	1	0			
			Sparta village.......... (Oct. 28-Nov. 15.)	1	0			
			Lapeer county: Attica township........ (May 5-June 13.)	1	0			
			Ottawa county: Zeeland township...... (Oct. 8-Jan. 6, 1900.)	2	0			
Lapeer county: Almont.................	*	....	Arenac county: Mason township........ (Sept. 29-Oct. 19.)	1	0			
Lapeer county: Lapeer township.......	*	....	St. Clair county: Berlin township........ (Sept. 20-Dec. 4.)	2	1			
Lapeer county: Mayfield township...... (Sept. —.)	1	0	Lapeer county: Arcada township....... (Oct. 19-Dec. 24.)	2	0			
Lenawee county: Adrian city............. (July 20-Dec. 18.)	22	4	Lenawee county: Rollin township........ (Sept. 20-Nov. 20.)	2	0			
Lenawee county: Palmyra township...... (Jan.-Mar. 20.)	3	2	Lenawee county: Fairfield township.....	2	0			
Lenawee county: Raisin township........	*	....	Lenawee county: Blissfield township..... (Feb. 2-Feb. 16)	1	1			
Livingston county: Iosco township.........	*	....	Ingham county: Vevay township........ (Aug. 23—.)	1	0			
Livingston county......	....	....	Ingham county: Ingham township...... (Oct. 1-Oct. 23.)	1	1			
Macomb county: Memphis village.......	*	....	Lapeer county: Dryden village......... (Sept. 12-Nov. 17.)	2	0			
Macomb county: Mt. Clemens city....... (May 1-Jan. 29, 1900.)	29	3	Macomb county: Richmond village...... (June 1-Dec. 8.)	10	1	St. Clair county: Yale village........... (Sept. 1-Oct. 29.)	1	0
			St. Clair county: Brockway township···· (Sept. 25-Nov. 20.)	2	1			
Manistee county: Arcadia township...... (— Oct. 5.)	1	1	Houghton county: Red Jacket village..... (Oct. 1-Nov. 4.)	1	0			
Mason county: Summit township......	*	....	Mason county: Riverton township..... (Aug. 2-Aug. 18.)	1	0			
Mecosta county: Big Rapids city......... (Dec. 1898-Mar. 11, 1899.)	1	2	Manistee county: Arcadia township...... (Feb. 20-Mar. 21.)	2	1			
			Montcalm county: Maple Valley township. (Feb.-June 4.)	6	3			

*This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Menominee county: Menominee city........ (—— Dec.)	300	32	Ionia county: Portland village........ (Mar. 19–April 13.)	1	0			
			Ontonagon county: Ontonagon village..... (April 21–May 10.)	1	0			
Midland county: Midland (city).......... (Feb. 10–Jan. 16, 1900.)	11	3	Midland county: Lincoln township...... (Nov.–Jan., 1900.)	1	0			
Missaukee county: Lake City village.......	*	....	Montcalm county: Pierson township...... (Dec. 18–Jan. 15, 1900.)	1	1			
Montcalm county: Edmore village .... (Aug. 10–Sept. 9.)	1	1	Montcalm county: Howard City village...	1	1			
Montcalm county: Stanton city............ (—— Aug. 25.)	3	1	Montcalm county: Evergreen township... (Oct. 16–Nov. 15.)	1	0			
Muskegon county: Cedar Creek township.	*	....	Muskegon county: Dalton township....... (Sept. 10–Dec. 12.)	5	1			
Muskegon county: Montague village......	1	1	Oceana county: Colfax township........ (April 5–May 21.)	4	3			
Newaygo county: Newaygo village .... (Oct. 15–Nov. 29.)	3	2	Newaygo county: Croton township....... (Oct. 24–Nov. 14.)	1	0			
Oakland county: Pontiac city........... (Aug. 10–Oct. 20.)	2	1	Oakland county; Troy township.......... (Dec. 14–Jan. 18, 1900.)	3	0			
			Sanilac county: Evergreen township... (Nov. 2–Dec. 31.)	4	2			
Saginaw county: Chesaning township...	*	....	Saginaw county: Maple Grove township. (Mar. 12–Sept. 1.)	3	0			
Saginaw county: Saginaw city............ (Jan.–Dec.)	51	14	Livingston county: Hartland township .... (April 21–June 14.)	1	1			
			Saginaw county: Jonesfield township... (July 1–Oct. 31.)	9	0			
			Saginaw county: Tittabawassee township (June 27–July 30.)	1	0			
Sanilac county: Lamotte township ..... (Oct. 6–Nov. 19.)	6	0	Sanilac county: Marlette township..... (Sept. 27–Nov. 21.)	4	1			
Sanilac county..........	....	....	St. Clair county: Wales township........ (June 24–July 15.)	1	0			
Shiawassee county: Durand village......... (June 4–Nov. 4.)	4	1	St. Clair county: Kimball township...... (Sept. 14–Oct. 21.)	1	0			

*This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Shiawassee county: Hazelton township.... (Sept. 16–Oct. 16.)	2	1	Clinton county: Duplain .... (Nov. 12–Dec. 12.)	1	0			
Shiawassee county: Owosso city............ (July 23–Dec. 5.)	8	2	Saginaw county: James township........ (Oct. 1–Nov. 1.)	1	0			
Shiawassee county......	....	....	Benzie county: Blaine township........ (Mar. 31–May 6.)	1	0			
St. Clair county: Port Huron city....... (Feb. 6–Apr. 14, 1900.)	38	8	Tuscola county; Arbela township....... (Sept. 9–Sept. 17.)	1	1			
St Joseph county; Three Rivers city...... (Aug.–Dec.)	7	2	St. Joseph county: Constantine township. (Mar. 14–May 10.)	1	0			
Tuscola county: Columbia township	*	....	Tuscola county: Almer township .... (Sept. 28–Oct. 17.)	3	0			
Tuscola county: Fremont township.....	*	....	Lapeer county: Arcada township ...... (Nov. 2–Feb. 20, 1900.)	3	0			
Tuscola county: Vassar township .... (Sept. 15–Oct. 10.)	2	0	Tuscola county: Millington township... (Sept. 16–Oct. 18.)	1	0			
Washtenaw county: Ann Arbor city.... .... (July 20–Sept. 30.)	6	1	Jackson county: Grass Lake village..... (Aug. 11–Oct. 4.)	2	1			
			Washtenaw county: Lodi township .... (Oct. 5–Oct. 25.)	1	0			
Washtenaw county: Bridgewater township. (Mar. 10–May 6.)	7	3	Washtenaw county: Saline township........ (May 4–May 24.)	6	1	Washtenaw county; Bridgewater township (Aug. 1–Nov. 14.)	9	2
Washtenaw county: Ypsilanti city........... (June 22–Dec. 27.)	20	2	Lenawee county: Macon township........ (July 1–July 20.)	1	1			
			Macomb county: Armada village........ (June 10–July 3.)	3	1			
			Sanilac county: Worth township .... (June 12–July 16.)	1	0			
Wayne county: Detroit city .... (Jan.–Dec.)	40	40	Barry county: Middleville village .... (Sept. 28–Nov. 6.)	1	0			
			Lenawee county: Rome township .... (Oct. 14–Jan. 21, 1900.)	2	1			
			Mackinac county: Mackinac Island city.. (July ——.)	2	0			
			Monroe county: Exeter township....... (Mar. 15–Apr. 20.)	2	0			

*This foot-note is on the bottom of the first page of this table.

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Wayne county: Detroit city (Jan.-Dec.)	40	40	Van Buren county: Decatur village (Oct. 1-Oct. 5.)	1	1			
			Wayne county: Springwells township (Aug. 18-Jan. 6, 1900.)	6	1			
Wayne county: Wyandotte city (Jan.-Dec. 8.)	26	9	Bay county: Merritt township (Dec. 19-Mar. 10, 1900.)	5	0			
			Wayne county: Springwells township (June 27-Aug. 26.)	1	0			
			Taylor township (Oct. 13-Nov. 4.)	1	0			
Wexford county: Cadillac city (Sept. 1-Mar. 1, 1900.)	13	2	Wexford county: Clam Lake township (Oct. 5-Oct. 28.)	1	0			
Wexford county: Springville township (Sept. 22-Oct. 16.)	1	0	Osceola county: Sylvan township (Oct. 22-Dec. 27.)	1	0			
Wexford county	....	....	Isabella county: Isabella township (Sept.-Oct. 1.)	1	0			
Northern part of State	....	....	Isabella county: Union township (Aug. 26-Sept.)	1	1			
Southern Michigan	....	....	Wexford county: Antioch township (Sept. 10-Oct. 18.)	1	0			
Upper Peninsula	....	....	Lapeer county: Metamora township (Nov. 22-Dec. 30.)	1	1			
Movement of infection of Typhoid Fever into Michigan from outside the State.								
Arkansas: Hot Springs	....	....	Livingston county: Cohoctah township (Sept. 27-Oct. 15.)	1	0			
Canada: Ottawa	....	....	Chippewa county: Pickford township (June 27-July 8.)	1	0			
Dakota	....	....	Eaton county: Windsor township (Oct. 10-Dec. 5.)	1	0			
			Ionia county: Easton township (Aug. 5-Aug. 20.)	1	1			
Finland	....	....	Gogebic county: Wakefield township (July 20-Aug. 20.)	1	0			
Indiana: Bristol	....	....	St. Joseph county: Mottville township (Sept. 21-Oct. 14.)	1	1			

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever* **into Michigan** *from outside the State.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Indiana: Evansville	....	....	Emmet county: Bear Creek township (Aug. 9-Aug. 30.)	1	0			
Indiana: Hammond	....	....	Calhoun county: Albion city (May 21—.)	1	0			
Indiana: Warsaw	....	....	Monroe county: Ida township (Aug. 6-Sept. 15.)	6	2			
Indiana	....	....	Kalamazoo county: Galesburg village (Aug. 5-Nov. 18.)	2	1	Barry county: Hope township (Mar. 15-Mar. 20.)	1	1
			Ottawa county: Holland township (June 10-Aug. 9.)	2	2			
Illinois: Chicago	....	....	Allegan county: Laketown township (Sept. 8-Oct. 10.)	1	0			
			Calhoun county: Burlington township (Aug. 1-Aug. 15.)	1	0			
			Jackson county: Blackman township (Apr. 6-June 10.)	5	0			
			Kalamazoo county: Vicksburg village (Aug. 13-Sept. 21.)	1	0			
			Leelanau county: Glen Arbor township (Nov. 6-Nov. 22.)	1	1			
			Manistee county: Bear Lake village (Mar. 15-Apr. 6.)	1	0			
			Brown township (—July 11.)	1	1			
			Ottawa county: Grand Haven city (Sept. 13-Oct. 12.)	1	0			
			St. Joseph county: Constantine village (Aug. 7-Aug. 30.)	1	0			
Illinois	....	....	Van Buren county: Covert township (Sept.—.)	1	0			
Minnesota	....	....	Isabella county: Rolland township (Mar. 1-May 2.)	2	0			
			St. Joseph county: Mendon township (Nov. 12-Jan. 1, 1900.)	1	0			
New York: Buffalo	....	....	Kent county: Algonac township (Aug. 9-Oct. 12.)	3	0			

TABLE 5.—CONTINUED.—*Movement of infection of typhoid fever* **into Michigan** *from outside the State.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Ohio: Toledo	....	....	Monroe county: Bedford township (Aug. 12-Sept. 21.)	1	0			
Ohio: Wauseon	....	....	Branch county: Coldwater township (Oct. 1-Nov. 1.)	1	0			
Ohio	....	....	Isabella county: Deerfield township (July-Nov. 9.)	2	1			
			Jackson county: Brooklyn village (Sept. 20-Jan. 3, 1900.)	4	0			
			Saginaw county: Chapin township (Oct. 4-Nov. 25.)	1	0			
Pennsylvania: Philadelphia	....	....	Cass county: Colvin township (Sept. 27-Oct. 19.)	1	1			
Porto Rico	....	....	Washtenaw couny: Augusta township (Oct. 1-Oct. 18.)	1	0			
South Carolina	....	....	Calhoun county: Marshall township (Jan. 1-Mar. 3.)	1	0			
Tennesse: Chickamauga	....	....	Eaton county: Sunfield township (——Jan. 22.)	1	1			
Washington, D. C.	....	....	Oakland county: Orion township (Feb. 3-Feb. 23.)	1	1			
Wisconsin	....	....	Van Buren county: Covert township (Sept. 3——.)	1	0			
Probable movement of infection of typhoid fever.								
Branch county: Coldwater city (July 3-Nov. 9.)	10	3	Lenawee county: Adrian city (July 18-Aug. 11.)	1	0			
Delta county: Escanaba city (May-Oct. 20.)	46	7	Iron county: Iron River village (Oct. 23-Dec.)	1	0			
Eaton county: Eaton Rapids city	3	0	Shiawassee county: Woodhull township (Aug. 12-Sept. 18.)	5	0			
Eaton county: Grand Ledge	....	....	Clinton county: Eagle township (Aug. 29-Sept. 25.)	1	0			
Emmet county: Petoskey city (Aug. 10-Oct. 6.)	3	0	Calhoun county: Homer village (Sept. 24-Feb. 31, 1900.)	5	2			
Gratiot county: Ithaca village (Aug. 25-Oct. 24.)	4	0	Gratiot county: Arcada township (Aug. 10-Nov.)	4	2			

TABLE 5.—Concluded.—**Probable** *Movement of infection of typhoid fever.*

First localities from which typhoid fever was spread.			Second localities infected from first.			Third localities infected from second.		
Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.	Localities.	Cases.	Deaths.
Jackson county: Springport township...	*	....	Ingham county: Aurelius township..... (Sept. 15-Oct. 10.)	1	0			
Oakland county: Pontiac city............ (Aug. 10-Oct. 20.)	2	1	Gratiot county: Ithaca village.......... (Sept.-Sept.)	1	0			
Tuscola county: Millington village......	1	0	Ogemaw county: West Branch village... (June 23——.)	1	0			
Washtenaw county: Ypsilanti city........... (June 22-Dec. 27.)	20	2	Wayne county: Northville village..... (Sept. 27-Oct. 28.)	1	0			
Probable movement of infection of typhoid fever into Michigan from outside the State.								
Ohio....................	....	....	Eaton county: Kalamo township...... (Sept. 22-Nov. 7.)	1	0			
Ohio: Toledo.................	....	....	Lenawee county: Fairfield township..... (July 25-Sept. 8.)	1	0			

*This foot-note is on the bottom of the first page of this table.

Measures taken to restrict typhoid fever—results.—In studying the effects of efforts of health officers for the restriction and prevention of typhoid fever, and of the difficulties experienced by some of them in carrying out the methods recommended by the State Board of Health to that end, it is interesting to note the difference in the reported number of cases of sickness and of deaths from this disease, in outbreaks where local health officers were able to enforce isolation and disinfection, and in those outbreaks in which, for any reason, those restrictive measures were neglected.

By Table 6 it may be seen that in the outbreaks relative to which the reports state that isolation and disinfection were enforced, there occurred 1.45 cases and .30 of one death per outbreak; whereas, in those outbreaks in which isolation and disinfection were neglected there were 3.06 cases and .77 of one death per outbreak, or nearly three times as many cases and more than twice as many deaths in outbreaks in which isolation and disinfection were neglected as there were in those outbreaks in which the restrictive measures were enforced.

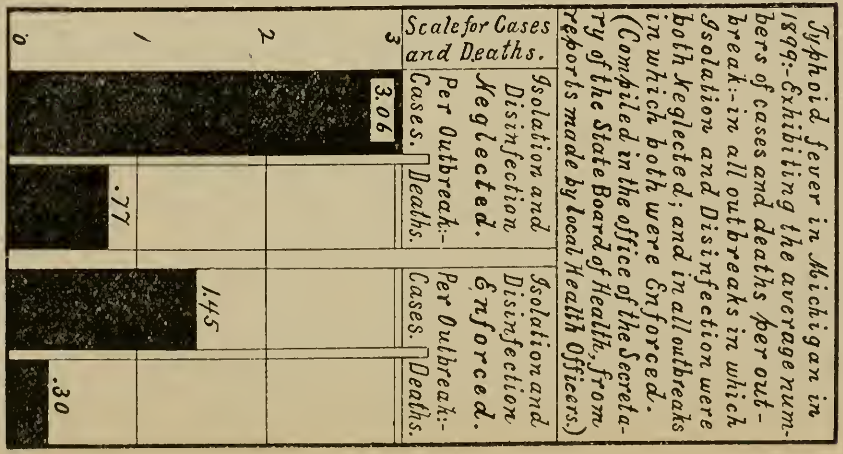
An examination of Table 6 shows that there were 305 outbreaks where isolation and disinfection were doubtful, and that the number of cases to the outbreak was much greater than in those outbreaks where isolation and disinfection were enforced.

TABLE 6.—TYPHOID FEVER IN MICHIGAN IN 1899: *Exhibiting the numbers and average numbers of cases and deaths per outbreak:—(1) in all the 839 outbreaks reported; (2) in the 305 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 18 outbreaks in which disinfection was enforced and isolation was doubtful; (4) in the 55 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 83 outbreaks in which isolation was enforced and disinfection was neglected; (6) in the 25 outbreaks in which disinfection was enforced and isolation was neglected; (7) in the 196 outbreaks in which both isolation and disinfection were neglected; (8) in the 157 outbreaks in which both isolation and disinfection were enforced.*

	(1) All outbreaks. (839 outbreaks.*)		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (305 outbreaks.)		(3) Disinfection enforced—isolation doubtful. (18 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (55 outbreaks.)		(5) Isolation enforced—disinfection neglected. (83 outbreaks.)		(6) Disinfection enforced—isolation neglected. (25 outbreaks.)		(7) Isolation and disinfection both neglected. (196 outbreaks.)		(8) Isolation and disinfection both enforced. (157 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	2,422	488	1,100	209	40	10	101	24	321	42	33	6	599	150	228	47
Averages........	2.89	0.58	3.61	0.68	2.22	0.55	1.84	0.44	3.87	0.51	1.32	0.24	3 00	0.77	1.45	0.30

*These do not include the cases and deaths in Detroit, Grand Rapids, Ecorse Township and Marquette city, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease was present in some part of the city nearly all the time.

ISOLATION AND DISINFECTION RESTRICT TYPHOID FEVER.



[PLATE 1067.]

TABLE 7.—TYPHOID FEVER IN MICHIGAN: *Exhibiting for the year 1899, and for the nine-year period, 1890-98, the numbers of reported outbreaks, cases and deaths in all outbreaks, and the numbers of outbreaks, cases and deaths for the same year and period of years, relative to which restrictive measures were neglected, and the numbers relative to which those measures were enforced; also the estimated numbers of cases and deaths prevented, in said year and period of years, by isolation and disinfection.*

Years.	All outbreaks.			Isolation and disinfection both neglected.			Isolation and disinfection both enforced.			Cases and deaths indicated as having been prevented by isolation and disinfection.	
	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths	Out-breaks	Cases.	Deaths.	Cases.	Deaths.
1899	*839	2,422	488	196	599	150	157	228	47	145	158
Totals 1890-98	5,273	22,339	3,756	743	4,873	648	587	1,241	198	14,169	1,173
Averages, nine years, 1890-98	586	2,482	417	83	541	72	65	138	22	1,574	130
Average cases and deaths per outbreak, 9 years, 1890-98	....	....	....	....	6.52	.87	....	2.12	.34	....	....

* See foot-note to Table 6.

TABLE 15.—*Exhibiting the number of inches of earth above the ground water in Lansing, by months, for the year 1899, compared with the per cent of reported cases and outbreaks of typhoid fever in Michigan, for each month of 1899; also average per cents of the same for the 12 years 1887-98, and the total numbers of cases and outbreaks included in this table. (Compiled from those cases of which the date of occurrence was given; and for those outbreaks of which the time of beginning was stated.)*

Specifications relative to ground water and typhoid fever.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	No. of cases and outbreaks included in this table.
Inches of earth above the water, year 1899	......	311	317	310	311	311	310	314	319	321	324	324	324	....
Per cent of cases of typhoid fever reported, year 1899	100	2	3	3	2	4	6	8	12	23	20	11	6	2,519
Per cent of outbreaks which began in each month, 1899	100	4	4	4	3	4	8	8	17	20	16	7	5	764
Inches of earth above the water, average 1887-98	......	306	306	304	301	300	298	299	300	303	305	307	307	....
Per cent of cases of typhoid fever reported, Av. 1887-98	100	4	3	2	3	3	3	6	14	21	20	14	8	24,826
Per cent of outbreaks which began in each month, Av. 1887-98	100	6	3	3	3	4	5	9	19	19	16	8	5	5,448

In the compilation of the reports for Tables 6 and 7 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed "Isolation and disinfection enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned, or statements doubtful."

Table 7 indicates that in 1899 there was a saving of 145 cases and 158 lives through isolation and disinfection.

In the nine years, 1890-98, in those outbreaks in which isolation and disinfection were neglected the average number of cases per outbreak was 6.52 and the average number of deaths .87 of one death; and in those outbreaks, in this period of years, in which restrictive measures were enforced, the average number of cases per outbreak was 2.12 and the average number of deaths per outbreak was .34 of one death.

Of the 1,149 males and 837 females who were reported to have died from typhoid fever within the twelve years, 1887-98, and of which the interval between the day of being taken sick and the day of death was given, 20 per cent of males and 23 per cent of females died before the tenth day of sickness; 16 per cent of males and 22 per cent of females died after ten to fifteen days of sickness. Sixty-eight per cent of males and 72 per cent of females died before the twenty-fifth day of sickness.

Average duration of typhoid fever.—Fatal and non-fatal cases.—The average duration of fatal cases of typhoid fever in 1899 was 19.66 days for males and 20.45 days for females.

In Table 9 it may be noticed that in *non-fatal* cases of typhoid fever for the twelve years, 1887-98, 63 per cent of the males and 63 per cent of the females recovered before the thirty-fifth day of sickness. The average duration of non-fatal cases in 1899 was, in males 32.5 and in females 29.8.

The average duration of cases of typhoid fever in 1899, fatal and non-fatal, was 26.1 days for males, 25.1 days for females, and 25.6 days for both sexes.

Age of occurrence of typhoid fever.—Table 10 shows that of the 806 males and 682 females who were sick with typhoid fever in 1899, and of whom the ages were reported, the greatest per cent of males were of ages between fifteen and nineteen years; and of females (in any five-year period) was between ten and fourteen years.

TABLE 8.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from typhoid fever in Michigan, during the year 1899, and averages for the 12 years, 1887-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of typhoid fever.														
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period of days.											
			All cases.	Under 11 days.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 days and over.
1899.	Males	181	100	25	19	19	10	10	2	6	3	3	1	1
	Females	159	100	24	24	14	9	9	8	5	3	0	2	3
Av. 1887-1898.	Males	96	100	20	16	16	16	11	6	4	3	3	1	4
	Females	70	100	23	22	15	12	10	6	4	4	1	2	3

TABLE 9.—*Exhibiting, by sex of patient, by per cent of cases which recovered in specified periods of time, the duration (in days) of non-fatal cases of sickness from typhoid fever, in Michigan, during the year 1899, and the averages for the 12 years, 1887-98. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of typhoid fever.														
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of cases in each period of days.											
			All periods.	Under 11 days.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 days and over.
1899.	Males	632	100	2	6	9	22	17	10	11	7	5	3	9
	Females	560	100	3	6	11	26	13	13	9	7	3	3	6
Av. 1887-1898.	Males	377	100	2	6	8	15	18	14	11	9	6	3	9
	Females	275	100	2	6	9	16	16	14	12	7	4	4	9

TABLE 10.—*Exhibiting, by sex, the per cent of persons in certain age-groups sick from typhoid fever in Michigan, during the year 1899, and the average for the 12 years 1887-98; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of person sick, years.	No. of cases included.	Age.—In periods of years.—Per cent of cases in each period of age.										
				All ages.	Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Males	22	806	100	16	15	16	15	10	9	5	5	3	4
	Females	20	682	100	20	19	18	13	8	7	5	4	2	4
Av. 1887-1898.	Males	23	678	100	14	12	14	21	14	9	6	4	3	4
	Females	21	510	100	17	16	19	14	9	7	5	4	3	5

TABLE 11.—*Exhibiting, by sex, the* **per cent** *of persons in certain age-groups who died of typhoid fever during the year 1899; also for the years 1892-98, the per cent the deaths in each group were of all the deaths from typhoid fever.*

Year.	Sex.	Average age of decedents, years.	No. of deaths included.	Per cent of deaths in certain age-groups.*										
				All ages.	Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Males.....	29	329	100	8	11	10	14	16	12	8	5	4	12
	Females..	27	269	100	12	12	19	15	6	9	6	5	4	13
1892-98.	Per cent the deaths in each age-group were of all the deaths.....	......	1,952	100	10	11	16	18	13	8	7	4	3	9

*In each age-group both years are included.

Table 11 shows that of the 329 males and 269 females who died of typhoid fever in 1899, and of whom the ages were reported, the greatest per cent of males were aged from twenty-five to twenty-nine years; and the greatest per cent of females were between fifteen and nineteen years old; and that fifty-nine per cent of the males and sixty-four per cent of the females were under thirty years of age.

Table 11 shows also that the greatest per cent of decedents of both sexes in the seven years 1892-98 died at ages between twenty and twenty-four years.

In studying Tables 10 and 11, and first two lines in Table 12, relative to age of persons who died with or who had typhoid fever, it should be held in mind that there are more persons living in the earlier ages than at the more advanced ages. In the last three lines of table 12, this fact is taken account of, and they exhibit the relative danger of death at each period of life, according to the experience in Michigan in the seven years 1892-8.

By Table 12 it may be seen, that to males the greater danger of death from typhoid fever was in the age-periods fifteen to twenty-nine years, especially in the period twenty to twenty-four years; the greatest death-rate of females was during the age-period fifteen to nineteen years.

Two lines of evidence of the prevalence of typhoid fever.—In studying the prevalence of typhoid fever in 1899, from the facts presented in the preceding and following pages, it must be borne in mind that those facts are derived from two distinct sources of information:

TABLE 12.—*Exhibiting, by sex, the* **number** *of persons in certain age-groups who died of typhoid fever during the year 1899; also by age-groups, the number of deaths in the seven years, 1892-98, per 10,000 inhabitants.*

Year.	Sex.	Average age of decedents, years.	No. of deaths included.	Number of deaths in certain age-groups.*									
				Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 years and over.
1899.	Males.....	29	329	27	36	32	47	53	38	27	17	14	38
	Females ..	27	269	31	31	52	40	17	23	17	13	11	34
1892-98.	Males.....	Deaths per 10,000 inhabitants, of the same sex, and age, in each age-group.		.54	1.06	1.96	3.34	2.59	1.73	1.46	1.01	1.13	.81
	Females ..			.52	1.47	1.96	1.35	1.30	.97	1.11	.89	.56	.74
1892-98.	The average number of deaths (both sexes) per 10,000 inhabitants in each age-group for the seven years, 1892-98............			.53	1.26	1.96	2.34	1.96	1.37	1.30	.96	.87	.77

*In each age-group both years are included.

1.—The numbers of outbreaks, of cases of sickness, and of deaths from typhoid fever are taken from special reports from health officers and other township, city and village officers, during the course of an outbreak, at its close, or in annual reports at the close of the year. If all the people and officers reported as the law provides, the facts presented would represent the *actual numbers* of outbreaks, cases of sickness, and deaths from typhoid fever which occurred in the State during the year; but *all* do not so report. It is just, however, to state that as the people generally are becoming better instructed in the measures recommended by the State Board of Health for the saving of life and health, better and more complete reports are made year by year. So, each year, we believe that an increasing proportion of the cases of sickness and deaths from the dangerous communicable diseases are reported to this office. This tends toward an apparent increase in the prevalence of the disease each year, modified, of course, by the real fluctuation in prevalence. While waiting for perfect reports, the facts derived from those now received are valuable for purposes of study.

TABLE 13.—*For the year 1899, and an average for the 13 years, 1886-98, the per cent of reports (from regular correspondents to the State Board of Health, and others) stating the presence of typhoid fever in Michigan; also, for the same year and period of years, the average number of outbreaks, number of localities of outbreaks, the cases of sickness and the deaths reported from typhoid fever.*

Years.	Per cent of weekly postal reports stating the presence of typhoid fever.	Reported outbreaks of typhoid fever.	Reported localities of outbreaks of typhoid fever.	Reported cases of sickness from typhoid fever.	Reported deaths from typhoid fever.
1899........................	9	862	679	3,194	638
Average 13 years, 1886-98.	10	518	461	2,630	466

2.—The prevalence of typhoid fever, or any given disease, as indicated by the "per cent of reports" is taken from the weekly postal-card reports from regular correspondents of the State Board, health officers of cities and villages, and others. The "per cent of reports" is the per cent of the whole number of reports received which stated the presence of the disease named; it gives the relative prevalence of the disease, under the observation of the physicians who report. It may represent the relative area of prevalence of the disease, combined with the relative number of weeks the disease continued where it did occur, *but not the number of cases.*

The weekly card-reports, however, furnish a valuable means of ascertaining, approximately, the relative prevalence of the several diseases in a given year and relative prevalence of a given disease in one year compared with other years, and it is as good a scheme for ascertaining the facts as is yet available. Therefore the sickness-statistics based upon those weekly card-reports should be relied upon for a comparison of the relative prevalence of typhoid fever in 1899, compared with preceding years. However, the evidence from the two sources may well be compared.

A comparison of the evidence from the two sources just mentioned, relative to typhoid fever during the years, 1886-1898, is facilitated by Table 13.

TABLE 14.—Height of Ground Water.—*Inches of earth above the water—by months for the year 1899; also averages for the 13 years, 1886-98, at* **Lansing,** *Mich.,—well in the Capitol grounds.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1899................	316	311	317	310	311	311	310	314	319	321	324	324	324
Av. 13 years, 1886–98	301	304	303	301	298	298	297	298	299	301	304	305	306

TABLE 15 is on page 160.

TABLE 16.—Typhoid Fever in Michigan.—*Average per cent of weekly card-reports stating the presence of typhoid fever, by months, for 10 years, 1878-87, and in the year 1899; also the average for the 13 years, 1886-98.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878–87..	12	10	9	7	5	5	5	7	14	20	22	20	14
1899................	9	3	2	3	3	4	7	7	12	14	21	18	10
Av. 13 yrs., 1886–98..	10	7	5	4	3	3	4	7	13	18	20	16	10

TABLE 17.—Rainfall in Michigan.—*Average number of inches, by months, for the 10 years, 1878-87, and in the year 1899; also averages for the 13 years, 1886-98.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878–87.	37.27	2.09	2.89	2.28	2.49	3.52	4.24	3.44	3.21	3.72	3.45	2.98	2.69
1899................	27.58	1.72	1.29	3.08	1.28	3.14	2.94	3.31	1.17	3.04	2.81	1.45	2.34
Av. 13 yrs., 1886–98.	31.60	2.52	2.14	2.05	2.42	3.56	3.09	2.33	2.70	2.85	2.56	2.97	2.41

TABLE 18.—TEMPERATURE OF THE WATER *in the well at the State Capitol in* **Lansing,** *Mich., by months for the year 1899; also averages for the 13 years, 1886–98.*

Year and period of years.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1899..................	51	55	50	48	49	50	50	51	50	53	* 0	0	0
Av. 13 years, 1886-98..	50	51	48	47	48	49	49	49	51	52	47	48	51

*In October, November and December there was no water in the well.

TABLE 19.—*Sickness from typhoid fever in Michigan (as indicated by the weekly card-reports by all observers) and the depth of earth (in inches) above the water in the well, and the temperature of the water in the well at* **Lansing,** *Michigan, averages by year and months for the 13 years, 1886-98.*

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from typhoid fever*........	10	7	5	4	3	3	4	7	13	18	20	16	10
Inches of earth above water in well†	301	304	303	301	298	298	297	298	299	301	304	305	306
Temperature of water in well‡......	50	47	44	47	48	49	49	49	51	52	52	52	51

*Per cent of all reports received (from observers in different parts of the State) which stated the presence of typhoid fever, from last line in Table 15.
†This line is copied from the last line in Table 14.
‡This line is copied from the last line in Table 17.

TABLE 20.—*Exhibiting the average total annual rainfall at stations in Michigan, the same for Lansing, the inches of earth above the ground water at* **Lansing,** *the inches of water in an undisturbed well at Lansing, and the reported sickness, from typhoid fever in Michigan, as indicated by the per cent of all the weekly card-reports which stated the presence of typhoid fever, during the year, 1899, and averages for the 13 years, 1886-98.*

Year, and period of years.	Average total annual rainfall at stations in Michigan, in inches.	Total annual rainfall at Lansing, in inches.	Inches of earth above the ground water at Lansing.	Inches of water in an unused well at Lansing.	Ground water higher (+) or lower (—) than the 13 years' average, in inches.	Average per cent of all weekly card-reports stating the presence of typhoid fever.	More (+) or less (—) sickness from typhoid fever than the 13 years' average.
1899..................	27.58	25.00	316	19	—4	9	—1
Av. 13 years, 1886-98.	31.60	30.31	301	23	....	10	....

Failure to report typhoid fever:—Several cases of typhoid fever having occurred in Le Roy Township, Ingham County, the health officer of that jurisdiction wrote to the Secretary of this Board relative to said cases, as follows:—

> "The local board of health of the township of Le Roy, passed resolutions some time ago for the health officer of this township not to quarantine, disinfect, etc., for typhoid fever, so I have not done it and know nothing about these cases.
>
> "These typhoid cases were treated by Williamston physicians and they do not report."

In reply to the foregoing letter, the secretary, August 26, 1899, wrote to the health officer as follows:—

"You state in your letter that the board of health passed resolutions instructing you not to isolate, disinfect, etc., in cases of typhoid fever. In the light of what sanitary science has revealed to us of the pollution of water supplies, epidemics of typhoid due to infected milk, and the number of deaths which this disease annually costs this State, this is decidedly an ill advised action on the part of your local board of health, and you should use your influence to rectify this proceeding. The law makes the health officer the adviser of the local board.

"However, providing your local board of health did otherwise instruct you, than to act according to the provisions of Act 137, Laws of 1883, Sec. 1673, Howell's Statutes, states that whenever any disease dangerous to the public health is found to exist in any township, the *board of health* shall *use all possible care* to prevent the spreading of the infection and to give public notice of infected places to travelers. Sec. 1647, Howell's Statutes, requires the local boards of health to make effectual provision to protect the safety of inhabitants, etc.

"Relative to reporting to the State Board of Health, Sec. 8, Act 81, Laws of 1883, states that the health officer shall report specially to the State Board of Health whenever he shall be required to do so by said Board.

"If the public health laws relative to physicians and householders reporting dangerous communicable diseases are not observed, you are required to report all such violations to the supervisor who is to prosecute for such violations; the prosecuting attorney conducting the suit if requested.

"Herewith I send you a copy of pamphlet No. 120, "Work of Health Officers," published by this Board. In this publication, I have marked the laws relative to the subjects quoted in this letter.

"P. S. I trust that you will report relative to cases of typhoid fever occurring in your jurisdiction, and relative to the cases of which I wrote to you July 21."

TYPHOID FEVER AMONG MICHIGAN VOLUNTEERS IN 1898, AND ITS RELATION TO THE GENERAL SICKNESS FROM THAT DISEASE IN THE STATE FOR THE YEARS 1898 AND 1899.

The Secretary of the State Board of Health made requests of local health officers, superintendents of hospitals, officers of regiments and companies, and others in authority, for information concerning typhoid fever among Michigan volunteers during the Spanish-American war of 1898. Hundreds of them had the disease and many went to their homes sick or convalescent.

The information contained in replies to those requests has been compiled in this office and a comparative study thereof is being made with a view to ascertaining what influence the sickness from typhoid fever among the Michigan volunteers had on the general sickness from that disease throughout this State.

It was intended to publish the results of this study in this annual report, but it not yet being complete, its publication is necessarily deferred until the issuance of the annual report for 1901.

MEASLES IN MICHIGAN.—DURING THE YEAR ENDING DECEMBER 31, 1899.

There were reported by local health officers to the Secretary of the State Board of Health, in all, 614 outbreaks of measles, in 504 local jurisdictions, as having occurred in Michigan during the year 1899; and in these outbreaks there were reported to have occurred 12,005 cases and 166 deaths.

The office of the State Board of Health is making constant efforts to get local health officials, and the people generally, to take measures to prevent the spread of measles, and to make reports to the local health officers and to the Secretary of the State Board of Health, concerning that disease in the several localities; but it is probable that a large number of the cases and deaths are not yet reported. From Detroit, for instance, the fatal cases only were reported.

MEASLES IN 1899, COMPARED WITH PREVIOUS YEARS.

According to reports made to the Secretary of the State Board of Health.—Table 1 shows that in 1899, as compared with the averages for the nine years 1890-98, the number of reported cases was 129 less, the reported deaths 56 more, the average cases per outbreak was 9.2 less, the number of deaths per outbreak was the same, and the deaths per 100 cases was five-tenths of one more, in 1899.

TABLE 1.—*Exhibiting the numbers of outbreaks, cases and deaths from measles, the number of localities in which they occurred, the average numbers of cases and deaths per outbreak, and the per cent of cases which proved fatal, for the year 1899, and the averages for the 9 years, 1890-98; with the departures of the same for 1899, from the average of the same for the 9 years, 1890-98.*

Year.	Reported outbreaks.	Reported localities.	Reported cases.	Av. No. of cases per outbreak.	Reported deaths.	Av. No. of deaths per outbreak.	Deaths per 100 cases.
1899..................	614	504	12,005	19.6	166	.26	1.4
Average for 9 years, 1890–98...............	422	378	12,134	28.8	110	.26	.9
Departures of 1899 from the averages for 9 years, 1890–98..	+192	+126	—129	—9.2	+56	0	+.5

Sickness-rates from reported measles.—The sickness-rate from reported measles for the State, excluding Detroit, where none but fatal cases were reported, was 56.32 cases per 10,000 population. The highest sickness-rate, by counties, was in Alger County, where the rate was 1,810.07 cases per 10,000 population. The rate in Kalkaska County (354.17) was next highest.

The lowest sickness-rate, .59 of one case per 10,000 population, was in Bay County.

Death-rates from reported measles.—The death-rate from reported measles for the State was .68 of one death per 10,000 population. The highest death-rate, by counties, was in Alger County, 44.61 deaths per 10,000 population, which was about sixty-five times the average death-rate for the State, and more than seven times the next highest death-rate (5.90 deaths per 10,000 population), which was in Mecosta County.

The death-rate in Wayne County was 1.01 deaths per 10,000 population. Considering the population of Detroit to be what the health officer estimated it, and subtracting it from the population of Wayne County, the death-rate in Wayne County, exclusive of Detroit, was 1.36 deaths per 10,000 population; and the death-rate in Detroit was .97 of one death per 10,000 population.

Fatality, or "case-mortality" from reported measles.—The fatality from reported measles in 1899, i. e., the proportion of reported cases which proved fatal was, for the whole State, 1.4 per cent, or about one death to 100 cases reported. The maximum fatality (33 per cent) occurred in Luce County. Probably this was because the mild cases were not as completely reported as in other localities. The minimum fatality (.25 of one death per 100 cases) occurred in Shiawassee County. In thirty-five counties from which sickness from measles was reported there were no deaths reported from this disease.

Study of the last two columns in Table 3 reveals two encouraging facts: the proportion of reported cases to inhabitants was nearly twice as great in the villages as in the townships, yet the proportion of reported deaths to inhabitants was not as large in the villages as in the townships. Apparently the first movement in the work of the restriction of measles—the reporting of the cases, has been well commenced in the villages in Michigan.

Number of outbreaks of measles in each month of the year 1899.—The last line of figures in Table 4, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months. There were 91 more beginnings than endings of outbreaks reported during the year 1899.

In computing the number of cases present in each month, each case is counted present in each month in which, or part of which, it was reported to have existed. The number of localities infected in each month were computed in a like manner.

TABLE 2.—*Numbers of cases and deaths reported from measles, and the cases and deaths per 10,000 persons living in each county in Michigan during the year 1899.*

State and counties.	Estimated population of Michigan for 1899.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.
State	2,426,331	† 11,976	166	‡ 56.32	.68
Alcona	5,429	0	0	0	0
Alger	1,569	284	7	1810.07	44.61
Allegan	39,474	156	2	39.52	.51
Alpena	20,387	2	0	.98	0
Antrim	14,946	86	1	57.54	.67
Arenac	8,518	1	0	1.17	0
Baraga	5,727	0	0	0	0
Barry	23,594	143	0	60.61	0
Bay	67,419	4	1	.59	.15
Benzie	11,596	35	0	30.18	0
Berrien	51,073	573	7	112.19	1.37
Branch	25,477	44	1	17.27	.39
Calhoun	52,436	280	2	53.40	.38
Cass	21,455	12	0	5.59	0
Charlevoix	12,637	33	0	26.11	0
Cheboygan	16,293	12	0	7.37	0
Chippewa	19,451	85	1	43.70	.51
Clare	8,499	201	0	236.50	0
Clinton	25,953	21	1	8.09	.39
Crawford	2,395	1	0	4.18	0
Delta	24,177	6	0	2.48	0
Dickinson	15,635	88	6	56.28	3.84
Eaton	33,273	108	0	32.46	0
Emmet	13,045	19	0	14.56	0
Genesee	41,957	254	0	60.54	0
Gladwin	5,765	3	0	5.20	0
Gogebic	15,229	12	0	7.88	0
Gd. Traverse	22,715	129	2	56.79	.88
Gratiot	28,911	33	0	11.41	0
Hillsdale	29,787	118	4	39.61	1.34
Houghton	55,124	245	3	44.45	.54
Huron	36,895	176	2	47.70	.54
Ingham	42,218	26	0	6.16	0
Ionia	37,344	59	0	15.80	0
Iosco	8,735	8	1	9.16	1.14
Iron	5,628	3	0	5.33	0
Isabella	24,758	370	7	149.45	2.83
Jackson	48,415	13	1	2.69	.21
Kalamazoo	45,535	210	0	46.12	0
Kalkaska	6,240	221	0	354.17	0
Kent	136,958	1,095	7	79.95	.51
Counties.					
Keweenaw	2,829	17	0	60.09	0
Lake	5,137	33	1	64.24	1.95
Lapeer	28,460	26	0	9.14	0
Leelanau	11,310	13	2	11.49	1.77
Lenawee	48,657	31	0	6.37	0
Livingston	19,911	14	1	7.03	.50
Luce	2,214	3	1	13.55	4.52
Mackinac	6,496	27	0	41.56	0
Macomb	34,105	5	1	1.47	.29
Manistee	28,469	808	14	283.82	4.92
Marquette	40,418	886	8	219.21	1.98
Mason	20,968	321	6	153.09	2.86
Mecosta	22,019	553	13	251.15	5.90
Menominee	25,248	9	1	3.56	.40
Midland	16,419	138	0	84.05	0
Missaukee	9,339	50	2	53.54	2.14
Monroe	34,236	193	0	56.37	0
Montcalm	36,059	333	3	92.35	.83
Montmorency	3,627	1	0	2.76	0
Muskegon	33,963	94	2	27.68	.59
Newaygo	17,436	186	1	106.68	.57
Oakland	44,465	63	1	14.17	.22
Oceana	17,725	8	0	4.51	0
Ogemaw	5,707	14	0	24.53	0
Ontonagon	10,769	79	2	73.36	1.86
Osceola	18,781	388	3	206.59	1.60
Oscoda	1,683	0	0	0	0
Otsego	5,447	8	0	14.69	0
Ottawa	43,739	245	4	56.01	.91
Presque Isle	7,441	43	0	57.79	0
Roscommon	1,187	0	0	0	0
Saginaw	81,314	325	2	39.97	.25
Sanilac	35,640	159	2	44.61	.56
Schoolcraft	8,763	15	1	17.12	1.14
Shiawassee	35,232	404	1	114.67	.28
St. Clair	57,091	28	0	4.90	0
St. Joseph	24,751	152	0	61.41	0
Tuscola	36,792	210	0	57.08	0
Van Buren	31,707	224	1	70.65	.32
Washtenaw	45,133	22	1	4.87	.22
Wayne	336,645	567†	34	154.73‡	1.01
Wexford	17,508	112	2	63.97	1.14

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*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894, including the population of Detroit, which was estimated by the health officer to be 300,000.

†This number does not include the twenty-nine fatal cases reported from Detroit.

‡Excluding the population of Detroit, where none except fatal cases of measles were reported.

TABLE 3.—*Exhibiting the numbers of outbreaks and cases of and deaths from measles which occurred in the cities, villages, and townships of Michigan in 1899, and the comparative numbers of outbreaks, cases, deaths, and fatality from this disease in cities, villages and townships. (Compiled from reports of local health officers to the Secretary of the State Board of Health.)*

Classes of political divisions.	Population.*	Health jurisdictions.	Outbreaks in:						Rates per 10,000 population.	
			Localities.							
			No. of	Per cent of all localities.	No. of	Cases.	Deaths.	Fatality. (Per cent deaths of cases.)	Cases.	Deaths.
State	2,426,331	1,583	504	31.8	614	12,005	166	1.4	56.32†	.68
Cities	954,412	77	52	67.5	78	3,691	66	1.8	55.96†	.69
Villages	265,548	302	104	34.4	122	2,468	12	.5	92.94	.45
Townships	1,206,371	1,204	348	28.9	414	5,846	88	1.5	48.46	.73

*Estimated by arithmetical method in the office of the State Board of Health. The average population of the cities is 12,395, of the villages 879, and of the townships 1,002.

†Excluding Detroit, where none except fatal cases were reported.

TABLE 4.—*Exhibiting the reported number of outbreaks of measles which began, the number which ended, and the number which were present, in each month of the year 1899, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Number began	26	41	58	90	65	59	34	20	12	30	49	81	565
Number ended	19	23	34	48	70	76	66	33	18	14	21	52	474
Number present	52	72	106	159	174	162	114	67	44	55	88	146	....

TABLE 5.—*Exhibiting the number and per cent of cases of measles present, and the number and per cent of cases taken sick, and the number and per cent of localities infected in Michigan in each month of the year 1899.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases present	235	452	807	1,163	1,905	1,598	612	213	191	490	1,134	1,768
Per cent of cases present	2	4	7	10	16	13	5	2	2	4	9	15
Number of cases taken sick	220	406	711	966	1,580	1,100	390	158	146	444	896	1,388
Per cent of cases taken sick	2	3	6	8	13	9	3	1	1	4	7	12
Number of localities present	52	72	105	158	169	157	111	65	44	55	87	144
Per cent of localities present	10	14	21	31	34	31	22	13	9	11	17	29

The second and fourth lines of figures in Table 5 exhibit what per cent the cases present in each month and the cases taken sick in each month were of the total number (12,005) of cases of measles reported to this office for the year 1899.

The last line of figures in this table exhibits what per cent the localities infected in each month were of the total number (504) of infected localities reported during the year 1899.

Source of contagium of cases of measles.—Of the 12,005 cases of measles reported to this office, as having occurred in Michigan in the year 1899, the local health officials reported relative to the source of contagium in ways which may be summarized as follows: Traced to a former case, 4,288; probably traced to a former case, 66; from outside jurisdiction, 195; probably from an outside jurisdiction, 16; unknown, 5,147; not stated, 2,291; attributed to infected articles, etc., 2.

Outbreaks of measles reported traced to previous outbreaks.—According to reports of local health officers in Michigan the contagium of measles was permitted to spread from 101 outbreaks, having an aggregate of 4,894 cases and seventy-two deaths, to 192 other outbreaks resulting in 3,516 cases and thirty-seven deaths. From some of these second localities, the contagium was further spread to third localities, resulting in thirty-two outbreaks with 916 cases and ten deaths; from thence to fourth localities resulting in seven outbreaks with sixteen cases, and from one of these localities the contagium spread to a fifth locality, resulting in an outbreak of ten cases.

Thirty-six outbreaks, with an aggregate of 735 cases and three deaths, were reported as having been traced to localities outside of Michigan. From some of these thirty-six outbreaks, the contagium was further spread to three localities, resulting in thirteen cases and one death. A total of 271 outbreaks with an aggregate of 5,206 cases and fifty-one deaths were actually traced to previous outbreaks of measles.

In eleven outbreaks, with an aggregate of 394 cases and one death, the contagium was reported as *probably* traced to other outbreaks in Michigan, and in four outbreaks, with thirty-one cases, as *probably* traced to outbreaks outside the State.

The reports of health officers throughout the State show that the great difficulty experienced in restricting this disease lies in the mistaken idea, so generally prevalent, that measles is not to be dreaded in childhood, but, rather, to be sought. And in mild cases no physician is employed, no reports made, and, consequently, no effort made to prevent its spread. Many health officers state that their compensation is not sufficient to allow them to seek out all neglected cases, fumigate premises, and bring the offenders to justice. While in many instances this disease is very mild in character, there are many who suffer throughout life from the after effects of the disease. Consumption and other diseases of the respiratory organs, sometimes follow measles. Aside from the diseases induced by measles, and the trouble and suffering caused by so many cases of sickness from this disease, statistics show that the mortality from it warrants vigorous means for the prevention of its spread.

The State Board of Health, by its systems of wide-spread education, is making earnest efforts to instruct the people generally as to the character of this disease, that it is a dangerous communicable disease, and, as such, can be and ought to be restricted.

Estimated number of outbreaks and cases of measles prevented and lives saved by isolation and disinfection.—Tables 6 and 7 and the accompanying diagram compare the average numbers of cases and deaths in outbreaks of measles where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in those outbreaks where these measures were neglected.* By Table 7 it may be seen that during the ten years, 1890-99, there were about twenty-one times as many cases per outbreak in those outbreaks in which these measures were neglected as in those outbreaks in which they were enforced.

By Table 6 it may be seen that during the year 1899 there were reported to the office of the State Board of Health 596 outbreaks of measles, with 12,351 cases and 150 deaths.† Had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column headed, "Isolation and disinfection both neglected," there would have occurred 22,237 cases and 232 deaths, and taking from these respectively the cases (12,351) and deaths (150) which did occur, leaves 9,886 cases and 82 deaths indicated as prevented in these 596 outbreaks, by isolation and disinfection. By the same method for each year the indicated saving in the 4,304 outbreaks which occurred during the ten years, 1890-1899, is 112,160 cases and 874 lives. This is shown in Table 7.

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*In the compilation of the reports for Tables 6 and 7 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and disinfection enforced." If, however, he neglects to properly isolate and disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed, "Isolation or disinfection or both not mentioned, or statements doubtful."

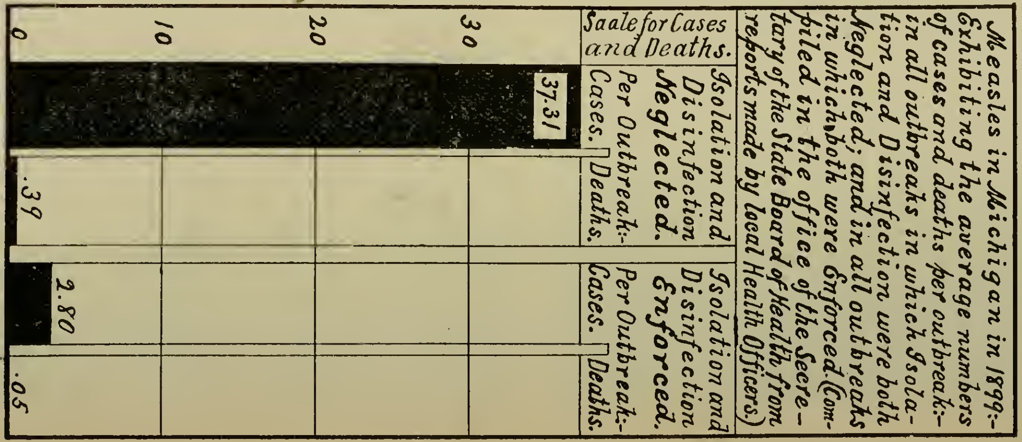
†*Definition of outbreak.*—For studying the influence of isolation and disinfection in restricting outbreaks of communicable diseases, an outbreak is considered as the existence of one or more cases of a particular communicable disease within any health officer's jurisdiction, whether city, village, or township. All cases of the disease occurring within the jurisdiction during the outbreak are considered as part of the outbreak, unless the contagium cannot be traced to cases within the jurisdiction, and can be clearly traced to cases outside of the jurisdiction, in which instance they are considered as constituting a separate outbreak. When a period of over sixty days has elapsed since the last case (in a given jurisdiction) died or recovered, the outbreak is considered as ended,—unless new cases occur the contagium of which can be traced back to the preceding cases, in which instance the latter cases are considered as part of the same outbreak. Possibly the sixty-day limit may, at some future time, be changed to ninety days; but in order to study the subject systematically, there must be a limit in time, as also in area. Also, comparisons of *years* require that outbreaks be counted as closed, at the end of the *year;* while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks,* even where they extend from one year into the next. This explains any apparent discrepancy between the numbers of outbreaks, cases and deaths here given and the numbers given at the beginning of this article.

TABLE 6.—MEASLES IN MICHIGAN IN 1899: *Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 596 outbreaks reported; (2) in the 201 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 8 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 35 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 22 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 40 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 230 outbreaks in which isolation and disinfection were both neglected; (8) in the 60 outbreaks in which isolation and disinfection were both enforced.*

	(1) All outbreaks. (596 outbreaks.*)		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (201 outbreaks.)		(3) Disinfection enforced—isolation doubtful. (8 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (35 outbreaks.)		(5) Disinfection enforced—isolation neglected. (22 outbreaks.)		(6) Isolation enforced—disinfection neglected. (40 outbreaks.)		(7) Isolation and disinfection both neglected. (230 outbreaks.)		(8) Isolation and disinfection both enforced. (60 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	12,351	150	3,122	48	68	2	144	5	140	2	127	1	8,582	89	168	3
Averages.	20.72	.25	15.53	.24	8.50	.25	4.11	.14	6.36	.09	3.18	.03	37.31	.39	2.80	.05

*A definition of the term "outbreak," and the facts relative to methods of compilation of outbreaks, are printed in foot-notes on page 173.

ISOLATION AND DISINFECTION RESTRICT MEASLES.



[PLATE 1068]

TABLE 7.—*Exhibiting for the 10 years, and for each of the 10 years 1890-99, the numbers of reported outbreaks, cases and deaths from measles; also for this 10-year period, the average number of cases and deaths per outbreak in all outbreaks; in those outbreaks in which isolation or disinfection or both were doubtful; isolation and disinfection both neglected; isolation and disinfection both enforced; and, also, the numbers of cases and deaths indicated as having been prevented by isolation and disinfection.*

Years.	All outbreaks.			Isolation or disinfection, or both, not mentioned, or statements doubtful.			Isolation and disinfection neglected.			Isolation and disinfection enforced.			Cases and deaths indicated as having been prevented by isolation and disinfection.*	
	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Cases.	Deaths.
1890	419	11,189	103	353	6,326	59	57	4,819	44	6	19	0	24,233	220
1891	392	12,338	118	309	6,492	59	71	5,920	63	11	27	0	20,347	231
1892	236	4,406	67	187	2,427	45	31	1,953	22	7	8	0	10,462	101
1893	357	5,440	71	238	2,569	53	70	2,681	14	10	24	0	8,233	0
1894	358	7,345	49	246	4,190	42	70	2,971	7	13	32	0	7,849	0
1895	269	4,462	13	152	2,660	7	56	1,563	6	25	72	0	3,043	14
1896	399	17,068	158	177	4,178	26	146	12,626	131	21	54	0	17,438	201
1897	766	26,458	147	313	7,027	44	324	18,653	101	46	112	0	17,641	90
1898	512	9,318	101	219	2,683	47	165	6.150	49	49	118	2	9,764	53
1899	596	12,351	150	201	3,122	48	230	8,582	89	60	168	3	9,886	82
Totals for the ten years, 1890-99	4,304	110,375	977	2,395	41,674	430	1,220	65,918	526	248	634	5	†128,896 †112,160	992 874
Annual averages for the ten years, 1890-99	430	11,038	98	240	4,167	43	122	6,592	53	25	63	.5	12,890	99
Average cases and deaths per outbreak, 1890-99	....	25.64	.23	....	17.40	.18	....	54.03	.43	....	2.56	.02	....	....

*The numbers of cases and deaths in this double column are found by multiplying "All outbreaks" for each year by the average number of cases or deaths per outbreak, in those outbreaks in which isolation and disinfection both were neglected, for that year, and deducting from the results thus obtained, the cases or deaths, as the case may be, which were *reported* to have occurred that year, to learn the numbers that would have occurred if efforts for the restriction of the disease had not been made. The instances in which isolation and disinfection were enforced are still so few that the evidence is not yet very satisfactory. †The two sets of numbers appearing in this column are based on two distinct methods of solution which are explained as follows: (1) The 128.896 cases and 992 deaths are totals of the columns representing cases and deaths saved as explained in the * foot-note; (2) the 112,160 cases and 874 deaths are obtained by multiplying the average numbers of cases and deaths per outbreak for the ten years, 1890-99 (54.03 and .43 where isolation and disinfection were neglected) by the total number of outbreaks to find the numbers which would have occurred if all outbreaks had been neglected, and subtracting therefrom the numbers of cases and deaths that were reported as having occurred during the ten-year period.

Period of incubation in measles.—The average of the 149 reported periods of incubation is about 10.3 days. The greatest number of cases in any one period was in the ten-day period. Further details are in Table 8.

TABLE 8.—*Exhibiting the reported period of incubation, stated in days, in 149 instances of measles. Compiled from reports of health officers in Michigan for the year 1899.*

Incubation period—days	2	3	4	5	6	7	8	9	10	11	12	14	15	17	20	21
Cases in each period	1	1	*4	†4	‡5	§21	¶9	‖22	**28	††6	‡‡13	§§23	¶¶4	1	2	‖‖5

*In 1 instance, reported as *about* 4 days. †In 2 instances, reported as *about* 5 days. ‡In 2 instances, reported as *about* 6 days. §In 10 instances, reported as *about* 7 days. ¶In 5 instances, reported as *about* 8 days. In 2 instances, reported as *about* 9 days. **In 13 instances, reported as *a out* 10 days. ††In 1 instance, reported as *about* 11 days. ‡‡In 7 instances, reported as *about* 12 days. §§In 6 instances, reported as *about* 14 days. ¶¶In 2 instances, reported as *about* 15 days. ‖‖In 1 instance, reported as *about* 21 days.

Ages of greatest prevalence of, and mortality from measles.—The reports of local health officials in Michigan, for the year 1899, stated the ages of 5,134 persons who were sick with measles, and the ages of 152 persons who died of that disease.

TABLE 9.—*Exhibiting in certain age-groups, the number of cases and the number of deaths from measles; the per cent that the cases in each group were of all cases of known ages, the per cent that the deaths in each group were of all deaths at known ages; and the per cent that the deaths in each group were of the cases in that group. Compiled from all reports for the year 1899, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.																	
Ages in groups of years.	All ages known.	Under 1.	1.	2.	3.	4.	Under 5.	5–9.	10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	60 and over.
No. of cases*.......	5,134	115	267	297	302	347	1,328	2,033	826	428	225	109	79	47	23	17	8	4	7
Per cent the cases in each group were of all cases of known ages	....	2.2	5.2	5.8	5.9	6.8	25.9	39.6	16.1	8.3	4.4	2.1	1.5	.9	.4	.3	.2	.1	.1
No. of deaths*.....	152	32	39	22	4	7	104	20	7	7	2	3	0	5	1	2	1	0	0
Per cent the deaths in each group were of cases in that group	3.0	27.8	14.6	7.4	1.3	2.0	7.8	1.0	.8	1.6	.9	2.8	0	10.6	4.3	11.8	12.5	0	0
Per cent the deaths in each group were of all deaths, at known ages........	....	21.1	25.7	14.5	2.6	4.6	68.4	13.2	4.6	4.6	1.3	2.0	0	3.3	.7	1.3	.7	0	0
Per cent the deaths in special groups were of all deaths, known ages........	....	68.4					.....	22.4			7.2					2.0			

*Does not include those cases or deaths where the age was not stated.

There are two erroneous and very harmful beliefs, quite prevalent among parents,—that measles cannot ultimately be escaped any more than teething and that the least dangerous time for persons to have the disease is while quite young children. Whatever ground there may be for these beliefs elsewhere, reports to this office, as may be seen in tabulated form in Tables 9, 10, 11, 12 and 13, of this article, show that none exists in Michigan; but that, on the contrary, facts here bear evidence that measles is a preventable disease; and that it is *more* fatal to young children than to persons in middle age.

Table 9 shows that for the year 1899, 68.4 per cent of all deaths from this disease was in children under five years of age. Table 10 shows that for a period of seven years, 1892-98, 56.3 per cent of all deaths from measles was in children under five years old. Table 13 shows that the fatality from this disease for ten years, 1890-99, was greatest in children under one year of age.

TABLE 10.—*Exhibiting in certain age-groups, the number of cases and number of deaths from measles in the year 1899, and the averages for the 7 years, 1892-98; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths. (Compiled from all reports which stated the ages.)*

Year.		Total number included.	Per cent of cases and deaths in certain age-groups.													
			All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 years and over.
1899.	Cases.....	5,134	100	25.9	39.6	16.1	8.3	4.4	2.1	1.5	.9	.4	.3	.2	.1	.1
	Deaths....	152	100	68.4	13.2	4.6	4.6	1.3	2.0	0	3.3	.7	1.3	.7	0	0
1892-98.	Cases......	28,885	100	24.0	41.9	16.0	7.8	4.3	2.2	1.6	1.1	.6	.2	.1	.1	.1
	Deaths....	279	100	56.3	13.3	9.7	6.1	4.3	3.9	1.4	1.4	1.8	.4	.7	0	.7

TABLE 11.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from measles, in Michigan, during the year 1899, and the averages for the 6 years 1893-98; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of persons who recovered—years.	No. of cases included.	Age.—In periods of years. Per cent of (non-fatal) cases in each period.													
				All ages.	Under 5 years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 years and over.
1899.	Males.....	9.4	2,423	100	25.3	40.9	15.0	8.8	4.8	2.4	1.2	.7	.5	.2	.1	.04	.2
	Females..	9.7	2,559	100	23.9	39.9	17.8	8.1	4.2	1.9	2.0	1.0	.4	.4	.2	.1	.1
1893-98.	Males.....	9.4	13,967	100	23.7	43.5	15.5	7.4	4.6	2.2	1.4	1.0	.5	.2	.1	.04	.1
	Females..	9.7	13,887	100	23.9	41.4	16.4	8.0	4.0	2.2	1.8	1.1	.7	.3	.1	.1	.1

TABLE 12.—*Exhibiting, by sex, the per cent of persons in certain age-groups who died of measles during the year 1899, and the averages for the six years, 1893-98.*

Year.	Sex.	Average age of decedents—years.	No. of deaths included.	Per cent of deaths in certain age-groups.										
				All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 years and over.
1899.	Males	5.0	79	100	68.4	15.2	5.1	6.3	2.5	1.3	0	0	0	1.3
	Females	7.8	73	100	68.5	11.0	4.1	2.7	0	2.7	0	6.8	1.4	2.7
1893-98.	Males	7.9	101	100	58.4	11.9	7.9	7.9	5.9	3.0	0	2.0	3.0	0
	Females	9.0	144	100	59.7	8.3	9.0	6.3	4.2	4.2	2.8	1.4	1,4	2.8

Case-mortality rates from measles at the different ages.—The total number of cases in which the ages were given, for the period of ten years, 1890-99, was 39,329 cases, of which number 480 were fatal cases,—giving a fatality, or a case-mortality rate, for this period of years, of persons at all ages, of 1.2 of one death per 100 cases of measles.

TABLE 13.—*In certain age-groups, the numbers of cases and deaths from measles in the 10 years, 1890-99, and the per cent that the deaths in each group were of the cases in that group. (Compiled from all the reports to the Secretary of the State Board of Health for the years 1890-99, which stated the ages.)*

	Under 1 year.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 to 64.	65 and over.
Cases—1890-99	608	9,481	16,053	6,434	3,231	1,772	869	637	419	225	111	38	21	21	17
Deaths—1890-99	88	284	66	36	30	17	14	6	10	7	4	3	0	2	1
Per cent	14.5	3.0	.4	.6	.9	1.0	1.6	.9	2.4	3.1	3.6	7.9	0	9.5	5.9

TABLE 14.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from measles, in Michigan, during the year 1899, and the averages for the 7 years, 1892-98. Per cent of deaths arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of measles.											
Year.	Sex.	No. of deaths included.	Duration of sickness:—Per cent of deaths in each period of days.								
			All deaths.	1 to 5.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 and over.
1899.	Males	37	100	35.1	35.1	5.4	18.9	2.7	2.7	0	0
	Females	42	100	50.0	28.6	9.5	4.8	0	2.4	0	4.8
1892-98.	Males	76	100	35.5	38.2	10.5	9.2	1.3	4.0	0	1.3
	Females	101	100	27.7	33.7	21.8	5.9	5.0	2.0	1.0	3.0

Average duration of measles.—Fatal and non-fatal cases.—The average duration of sickness from measles in non-fatal cases in 1899, was 13.8 days for males and 13.6 days for females. The average duration of fatal cases in 1899 was 9.1 for males and 8.4 for females.

TABLE 15.—*Exhibiting, by sex of patient, by per cent of cases which recovered in specified periods of time, the duration (in days) of non-fatal cases of sickness from measles in Michigan, during the year 1899, and the averages for the 7 years, 1892-98. Per cent of cases arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of measles.															
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of cases in each period of days.												
			All periods.	1 to 5 days.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 days and over.
1899.	Males	2,139	100	5.8	30.3	39.5	12.5	5.5	3.3	1.3	.3	.6	.2	.2	.6
	Females .	2,215	100	4.2	30.1	41.7	12.4	5.6	3.4	.9	.8	.3	.1	.1	.3
1892-98.	Males	8,793	100	6.6	40.2	39.9	7.7	2.7	1.2	.5	.5	.2	.1	.1	.1
	Females .	8,712	100	6.9	39.4	40.9	7.5	2.9	1.1	.6	.4	.2	.2	.01	.1

Proportion of measles in the different months of the year 1899.—Table 16 exhibits evidence, from two sources, on the proportion of measles reported in each month of the year 1899, namely, the sickness-statistics and the contagious-disease statistics. The *first* line states the per cent of all weekly postal-card *reports*, made by physicians in active general practice, which reported the presence of measles under their observation. The *second* line states the average per cent of all these *reporters* who stated the presence of measles. The *third* line states the average order of prevalence of measles in the list of diseases reported. The *fourth* line represents the *prevalence* of measles, according to the sickness-statistics, being a combination of the first and third lines of this table (the method of combining them is explained on pages 122-3 of the annual report of this Board for the year 1890). In this fourth line the smallest numbers indicate the greatest prevalence,—for instance, May is 1 or *first* in prevalence,—more measles in May than in any other month; April is 2 or *second* in prevalence; June is 3 or *third* in prevalence; and so on. The *fifth* line represents by months the number of outbreaks of measles reported to this office by health officers, including only the reports which gave the months in which the outbreaks began—reports of thirty-two outbreaks did not give dates, and seventeen outbreaks began in 1898, and, of course, those outbreaks could not be included in this line.

The evidence of the sickness-statistics, summarized in the fourth line of this table (16) indicates that the maximum prevalence of measles in Michigan in 1899 occurred in May, and the minimum where sickness was reported present was in February. The fifth line of the table, which is based on the contagious-disease statistics, indicates that the maximum number of reported outbreaks occurred in April and the minimum in September. This evidence is only for a single year, and might, therefore, be exceptional. In Exhibit X, of this annual report for 1899, is a statement of the average per cent of weekly card reports stating the presence of measles by months for the twenty-two years, 1877-98, from which it appears that the maximum occurs in May, and the minimum in January and October.

TABLE 16.—*Measles in Michigan during the year 1899, exhibiting, by months, the per cent of all weekly card-reports received which stated the presence of measles; the average per cent of all observers reporting weekly who reported measles; the average order of prevalence of measles where it was present; the prevalence of measles, according to the sickness statistics, and the number of outbreaks of measles reported by health officers.*

1899.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Per cent of weekly card reports stating presence of measles	6	2	3	7	11	14	10	9	4	3	2	3	6
Average per cent of observers who reported measles present	12	5	7	15	21	25	19	17	6	5	4	9	11
Average order of prevalence where present	2.3	2.2	4.0	2.9	1.9	2.1	2.0	2.2	2.0	2.8	2.8	2.8	2.3
Prevalence*	(5)	8	12	7	2	1	3	4	6	9	11	10	5
Outbreaks†	565	26	41	58	90	65	59	34	20	12	30	49	81

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* According to the sickness-statistics, as explained in the text accompanying this table. In the fourth line of figures in this table, the smallest numbers indicate the greatest prevalence.

† The numbers in this line show the numbers of outbreaks which began each month.

WHOOPING-COUGH IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1899.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health, 332 outbreaks of whooping-cough in 306 localities in Michigan, which resulted in 6,509 cases and 216 deaths.

Excluding Detroit, from which only the twenty-four fatal cases were reported, the average number of cases per locality, in 1899, was 21.3; the average number of deaths per locality was .71 of one death; and, excluding Detroit, the fatality from this disease, i. e., the proportion of reported cases which proved fatal, was 2.96 per cent, or about three deaths to 100 cases.

The death-rate from this disease for the State, according to the reports to this office, was .89 of one death per 10,000 inhabitants.

Whooping-cough in 1899 compared with previous years.—The increase, shown in Table 1, in the number of reported cases of and deaths from whooping-cough in 1899 as compared with the average numbers for the twelve years, 1887-98, may not indicate a greater prevalence of this disease in 1899, but only that it is being more frequently and carefully reported. Although the proportion of all cases which occur that are reported is evidently increasing, it is probable that there are still cases and deaths in Michigan which are not reported to this office. In many instances the fatal cases, only, are reported.

TABLE 1.—*Whooping-cough in Michigan in 1899, and the total and average for the 12 years 1887-98. Exhibiting the numbers of reported cases and deaths and the number of localities in which the presence of the disease was reported, together with the cases and deaths per locality and per 100,000 inhabitants, and the per cent the deaths were of cases. (Compiled from reports received at the office of the Secretary of the State Board of Health.)*

Years.	Cases.	Deaths.	Localities.	Cases per locality.	Deaths per locality.	Cases per 100,000 inhabitants.	Deaths per 100,000 inhabitants.	Per cent deaths were of cases.
1899.......	*6,509	216	306	21.3	.71	†304.99	8.90	†2.96
Totals, 1887-98..	41,620	1,143	2,404	....	....	....	....	....
Av. for 12 years...	3,469	95	200	17.3	.48	156	4.3	2.7

*In numerous instances only the fatal cases were reported to this office.
†Exclusive of Detroit, from which only the twenty-four fatal cases were reported.

Distribution of whooping-cough by counties in Michigan during 1899.—Table 2 exhibits the distribution of whooping-cough by counties in this State during the year 1899, according to the reports made to the Secretary of the State Board of Health. The table shows the reported numbers of cases and deaths, also the sickness and death-rates from whooping-cough in each county from which the disease was reported.

TABLE 2.—*Numbers of cases and deaths reported from whooping-cough per 10,000 persons living in each county in Michigan during the year 1899. (Compiled from reports of health officers.)*

State and counties.	Estimated population of Michigan for 1899.*	Number of reported		Number per 10,000 population of	
		Cases.	Deaths.	Cases.	Deaths.
State.........	2,426,331	†6,485	216	†30.50	.89
Alcona.......	5,429	0	0	0	0
Alger........	1,569	10	0	63.73	0
Allegan......	39,474	9	0	2.28	0
Alpena	20,387	101	2	49.54	.98
Antrim	14,946	4	0	2.68	0
Arenac	8,518	15	6	17.61	7.04
Baraga.......	5,727	0	0	0	0
Barry	23,594	241	4	102.14	1.70
Bay...........	67,419	9	3	1.33	.44
Benzie.......	11,596	8	0	6.90	0
Berrien......	51.073	31	2	6.07	.39
Branch	25,477	3	2	1.18	.79
Calhoun......	52,436	327	2	62.36	.38
Cass..........	21,455	7	0	3.26	0
Charlevoix ..	12,637	1	0	.79	0
Cheboygan ..	16,293	1	1	.61	.61
Chippewa....	19,451	415	2	213.36	1.03
Clare.........	8,499	82	0	96.48	0
Clinton	25,953	14	1	5.39	.39
Crawford	2,395	2	0	8.35	0
Delta	24,177	7	0	2.90	0
Dickinson...	15,635	62	7	39.65	4.48
Eaton........	33,273	1,092	10	328.19	3.01
Emmet......	13,045	40	0	30.66	0
Genesee	41,957	30	3	7.15	.72
Gladwin	5,765	0	0	0	0
Gogebic	15,229	6	0	3 94	0
Gd. Traverse.	22,715	51	1	22.45	.44
Gratiot	28,911	53	7	18.33	2.42
Hillsdale	29,787	18	3	6.04	1.01
Houghton....	55,124	140	16	25.40	2.90
Huron	36,895	36	2	9.76	.54
Ingham	42,218	143	1	33.87	.24
Ionia.........	37,344	516	4	138.17	1.07
Iosco.........	8,735	44	3	50.37	3.43
Iron.	5,628	0	0	0	0
Isabella......	24,758	103	2	41.60	.81
Jackson......	48,415	323	5	66.71	1.03
Kalamazoo ..	45,535	86	1	18.89	.22
Kalkaska.....	6,240	61	3	97.76	4.81
Kent.........	136,958	255	8	18.62	.58
Counties.					
Keweenaw...	2,829	0	0	0	0
Lake.........	5,137	1	0	1.95	0
Lapeer.......	28,460	110	2	38.65	.70
Leelanau	11,310	4	1	3.54	.88
Lenawee.....	48,657	16	1	3.29	.21
Livingston...	19,911	0	0	0	0
Luce.........	2,214	0	0	0	0
Mackinac....	6,496	12	2	18.47	3.08
Macomb	34,105	14	3	4.10	.88
Manistee	28,469	50	3	17.56	1.05
Marquette ...	40,418	295	6	72.99	1.48
Mason........	20,968	161	6	76.78	2.86
Mecosta......	22,019	67	3	30.43	1.36
Menominee..	25,248	77	15	30.50	5.94
Midland......	16,419	273	5	166.27	3.05
Missaukee ...	9,339	5	0	5.35	0
Monroe......	34,236	28	1	8.18	.29
Montcalm....	36,059	192	7	53.25	1.94
Montmore'cy	3,627	9	0	24.81	0
Muskegon...	33,963	5	1	1.47	.29
Newaygo	17,436	2	1	1.15	.57
Oakland......	44,465	3	1	.67	.22
Oceana.......	17,725	5	1	2.82	.56
Ogemaw.....	5,707	40	3	70.09	5.26
Ontonagon ..	10,769	13	1	12.07	.93
Osceola......	18,781	108	0	57.50	0
Oscoda.......	1,683	20	0	118.84	0
Otsego	5,447	1	1	1.84	1.84
Ottawa.......	43,739	22	0	5.03	0
Presque Isle.	7,441	0	0	0	0
Roscommon.	1,187	0	0	0	0
Saginaw......	81,314	114	5	14.02	.61
Sanilac	35,640	126	8	35.35	2.24
Schoolcraft..	8,763	23	3	26.25	3.42
Shiawassee ..	35,232	71	1	20.15	.28
St. Clair......	57,091	6	2	1.05	.35
St. Joseph...	24,751	23	1	9.29	.40
Tuscola.......	36,792	18	0	4.89	0
Van Buren ..	31,707	113	3	35.64	.95
Washtenaw..	45,133	6	2	1.33	.44
Wayne.	336,645	†86	26	†23.47	.77
Wexford.....	17,508	20	0	11.42	0

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894.

†Exclusive of Detroit, from which only the twenty-four fatal cases were reported.

Sickness and death-rates from reported whooping-cough.—Table 2 shows that the sickness-rate for the State, in 1899, was 30.50 cases per 10,000 population. This rate is exclusive of Detroit, from which only the twenty-four fatal cases were reported,—with a population of 300,000, as estimated for 1899 by the health officer of the city.

The highest sickness-rate, by counties, was in Eaton County, where the rate was 328.19 cases per 10,000 population. There were 1,092 cases reported from this county, more than double the number reported from any other county.

By counties, the lowest sickness-rate, .61 of one case per 10,000 population, was in Cheboygan County, from which only one case was reported. Oakland County, having a sickness-rate of .67 of one case per 10,000 population, and Charlevoix County, .79 of one case per 10,000 population, had the next lowest sickness-rates.

Table 2 also shows that the death-rate for the State in 1899 was .89 of one death per 10,000 population.

The highest death-rate, by counties, was in Arenac County, 7.04 deaths per 10,000 population.

From nineteen counties from which sickness from whooping-cough was reported there were no deaths reported from this disease.

The lowest death-rate, from counties from which deaths were reported, was in Lenawee County, .21 of one death per 10,000 population. Kalamazoo and Oakland Counties, having the same rate, .22 of one death per 10,000 population, were next lowest.

Whooping-cough in each month of the year, 1899.—From Table 3 it appears that the prevalence of whooping-cough is quite uniform throughout the year. A study of Exhibit X, of the article on "Sickness Statistics" in this report, shows that whooping-cough, according to the weekly card-reports made to this office, during the twenty-two years, 1877-98, varied but little in the different months; the *lowest* monthly average of reports which stated the presence of whooping-cough was 13 per cent of all reports received, while the *highest* monthly average was only 17 per cent. The general monthly average for the twenty-one years was 14 per cent.

TABLE 3.—*Exhibiting the reported number of outbreaks of whooping-cough which were present, in each month of the year 1899, in the different local jurisdictions of Michigan.*

Months	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Outbreaks present	51	55	56	51	53	57	72	69	65	59	73	84

Source of contagium of whooping-cough and how the disease is spread.—Of the 6,509 cases of whooping-cough reported, during the year 1899, as exhibited in Table 4, the local health officers reported the source of contagium as follows: Traced to a former case, 524; from outside jurisdiction, 52; probably from outside jurisdiction, 2; unknown, 4,770; not stated or indefinitely reported, 1,161; from the reports by registrars to the Secretary of State which were not otherwise reported to this office, and in which no source of contagium was mentioned, 24; total, 6,509.

Outbreaks of whooping-cough reported traced to previous outbreaks.—According to reports of local health officers in Michigan the contagium of whooping-cough in forty-six outbreaks, with an aggregate of 631 cases and fourteen deaths, was traced to outside jurisdictions. From one of these second localities the contagium was permitted to spread to another locality resulting in twelve cases. Three outbreaks were reported as *probably* traced to preceding outbreaks.

TABLE 4.—*Reported source of contagium of cases of whooping-cough, in 1899.*

Traced to a former case	524
Contagium reported as from outside jurisdiction	52
Contagium reported as probably from outside jurisdiction	2
Unknown or reports not definite (includes those reported "Contagium," "Sporadic," "Spontaneous," "*De Novo*," etc.)	4,770
Not stated (including cases reported by registrars to Secretary of State and not reported to this office)	1,161
All cases	6,509

Three outbreaks, with an aggregate of eighty-two cases, were traced to outbreaks outside of Michigan.

Transgression of the public health laws.—Strict isolation and disinfection enforced in the 310 outbreaks of whooping-cough would have lessened to a considerable degree the number of cases and deaths from the disease in 1899, and the carelessness on the part of physicians in some cases, health officers in some, and the people generally, borders on criminality. Such carelessness must be due to ignorance of the importance of the disease, for whooping-cough, for the past five years, has caused more deaths in Michigan than either scarlet fever or measles,* and when this information has become sufficiently familiar to the people of the State, and the vital necessity of the isolation and disinfection of the disease is fully understood, then coöperation may be expected, and a diminution of the number of cases and deaths from whooping-cough may be expected.

The following quotations from reports of local health officers show some of the difficulties experienced by health officers in restricting this disease:—

"Not one in 100 cases are reported to the health officer, in fact, there have been no cases reported to me. I have seen a number of cases in my own practice. Another feature is that only a small percentage of the patients have the whoop. They therefore reason that it is not whooping-cough, and some are so foolish as to expose young children and infants by nursing them, etc., when they have been told they have whooping-cough, but not the characteristic whoop. There is probably now, not more than a dozen houses in this township that have not one or more cases."—*Dr. Wm. J. Kay, health officer, Attica Township, Lapeer County.*

"There has never been in this township an effort made to restrict this disease. Our local regulations do not provide for quarantine, isolation, or disinfection. It will be exceedingly difficult to introduce these measures until people are educated up to recognizing whooping-cough as a contagious disease. This I have diligently endeavored to do. Many cases have not been reported at all, and in every case which I ascertained and visited, people expressed the greatest surprise that I should take any cognizance of this disease. I am happy to say, however, that parents have been quite willing to follow my advice and request to confine children sick with whooping-cough to their own premises, to keep them out of school, and to limit their intercourse with other children. Hope to make further progress in time to come."—*Dr. Theo. Schmalzriedt, health officer, Springwells Township, Wayne County.*

"A girl attending school at Lake Odessa, Mich., came home to visit parents, attended Christmas exercises, exposed entire vicinity. She did not know she had whooping-cough.

"Local board met and took action instructing health officer not to isolate patient or disinfect premises."—*Dr. P. C. Smith, health officer, Assyria Township, Barry County.*

There were 123 cases and two deaths reported in this outbreak from January to July, 1899. A later outbreak of one case was reported in

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*According to the returns made to the Secretary of State.

October, 1899. In this outbreak, Dr. Smith reports that he was instructed by the local board not to disinfect.

While some of the localities in the State, and a portion of the people, are in sympathy with the modern sanitary thought and the restriction of this disease, and while the conditions shown in the above quotations do not exist in every locality, still reports from various parts of the State show similar difficulties met by local health officers and physicians in restricting this disease.

Table 5 shows that of 310 outbreaks, in 180 of them isolation and disinfection were either not mentioned or the statements were so doubtful as to be impossible of classification; a majority of them were probably neglected; in two outbreaks disinfection was enforced and isolation was doubtful; in six outbreaks, isolation was enforced, but disinfection was doubtful; in six outbreaks disinfection was enforced and isolation was neglected; in eight outbreaks isolation was enforced and disinfection was neglected; in ninety-seven outbreaks isolation and disinfection were both neglected, and out of the 310 outbreaks reported, only eleven were reported as enforced. The results of the different modes of action are shown in Table 5.

Estimated number of outbreaks and cases of whooping-cough prevented and lives saved by isolation and disinfection.—Comparisons are made in Table 5, of the average numbers of cases and deaths in outbreaks of whooping-cough where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average numbers of cases and deaths in outbreaks where these measures were neglected.*

By this table (5) it may be seen that during the year 1899 there were reported to the office of the State Board of Health, 310† outbreaks of whooping-cough, with 5,248 cases and 168 deaths. Had no efforts at restriction been made, and had the average number of cases and deaths per outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 8,454 cases and 223 deaths. Had the average numbers of cases and deaths in all outbreaks been the same as those in the column headed "Isolation and disinfection both enforced," there would have occurred only 564 cases and fifty-six deaths, or 4,684 cases of sickness and 112 deaths from whooping-cough would have been prevented.

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*In the compilation of the reports for Table 5 showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and disinfection both neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and disinfection enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or disinfection or both not mentioned; or statements doubtful."

†Whenever a break of sixty days or more has occurred in the progress of a communicable disease in a given township, village or city it has been regarded as two different outbreaks, but if the second appearance of the disease could be traced from the first the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the end of the *year;* while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks,* even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

TABLE 5.—WHOOPING-COUGH IN MICHIGAN IN 1899: *Exhibiting the average numbers of cases and deaths per outbreak:—(1) in all the 310 outbreaks reported; (2) in the 180 outbreaks in which it is doubtful whether or not disinfection or isolation was enforced; (3) in the 2 outbreaks in which disinfection was enforced and isolation doubtful; (4) in the 6 outbreaks in which isolation was enforced and disinfection was doubtful; (5) in the 6 outbreaks in which disinfection was enforced and isolation neglected; (6) in the 8 outbreaks in which isolation was enforced and disinfection neglected; (7) in the 97 outbreaks in which isolation and disinfection were both neglected; (8) in the 11 outbreaks in which isolation and disinfection were both enforced.*

	(1) All outbreaks. (310 outbreaks.)		(2) Isolation or disinfection or both not mentioned, or statements doubtful. (180 outbreaks.)		(3) Disinfection enforced —isolation doubtful. (2 outbreaks.)		(4) Isolation enforced—disinfection doubtful. (6 outbreaks.)		(5) Disinfection enforced —isolation neglected. (6 outbreaks.)		(6) Isolation enforced—disinfection neglected. (8 outbreaks.)		(7) Isolation and disinfection both neglected. (97 outbreaks.)		(8) Isolation and disinfection both enforced. (11 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals....	5,248	168	2,520	93	10	0	11	1	30	1	12	1	2,645	70	20	2
Averages.	16.93	.54	14.00	.52	5.00	0	1.83	.17	5.00	.17	1.50	.13	27.27	.72	1.82	.18

Period of incubation in whooping-cough.—The average period of incubation in the twenty-six reported instances is twelve days; the greatest number of instances given in any single period was in the fourteen-day period.

TABLE 6.—*Exhibiting the reported period of incubation, stated in days, in 26 instances of whooping-cough. Compiled from reports of health officers in Michigan, for the year 1899.*

Incubation period—days	6	7	8	9	10	11	14	21	28
Instances in each period	1	*3	†1	3	‡5	§1	¶10	1	‖1

* In 1 of these instances, reported as about 7 days. † In this instance, reported as about 8 days. ‡ In 2 of these instances, reported as about 10 days. § In this instance, reported as about 11 days. ¶ In 6 of these instances, reported as about 14 days. ‖ In this instance, reported as about 28 days.

TABLE 7.—*Exhibiting in certain age-groups, the numbers of cases and deaths from whooping-cough, the per cent that the cases in each group were of all cases of known ages; the per cent that the deaths in each group were of all deaths at known ages; and the per cent that the deaths in each group were of the cases in that group. Compiled from all reports for the year 1899, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.*																
Ages in groups of years.	All known ages.	0–1.	1–2.	2–3.	3–4.	4–5.	Under 5.	5–9.	10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50 and over.
No. of cases	1,218	184	127	112	120	102	645	400	120	23	8	2	4	4	2	4	6
Per cent the cases in each group were of all cases of known ages		15	10	9	10	8	53	33	10	2	.7	.2	.3	.3	.2	.3	.5
No. of deaths	192	115	41	14	7	6	183	7	0	1	1	0	0	0	0	0	0
Per cent the deaths in each group were of all cases in that group	16	63	32	13	6	6	28	2	0	4	13	0	0	0	0	0	0
Per cent the deaths in each group were of all deaths, known ages		60	21	7	4	3	95	4	0	.5	.5	0	0	0	0	0	0
Per cent the deaths in special groups were of all deaths, known ages		95					99		1								

*Ages of greatest prevalence of, and mortality from whooping-cough.**—From Table 7 it may be seen that eighty-six per cent of all the sickness, and ninety-nine per cent of all the deaths from whooping-cough occurred in children under ten years of age; that the fatality from this disease was greatest in children under one year old—sixty-three per cent of the reported cases of that age having proved fatal; and, also, that sixty per cent of all deaths from this disease were in children under one year old.

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*In dividing the ages into five-year periods, the first period includes all ages from birth to five years, or all under five years of age. The second five-year period includes all ages of five years and over and less than ten years. In each succeeding period the same arrangement is followed.

In children under ten years old, the per cent of deaths of each sex was the same—99 per cent—Table 9. Of the 173 cases of sickness in persons over ten years of age only two proved fatal, one, a male, eighteen years old, and one, a female, twenty-two years old.

The average age of non-fatal cases of whooping-cough in 1899 was 6.2 years for males and 6.4 years for females; for fatal cases the average age was 1.1 years for males and 1.4 years for females.

TABLE 8.—*Exhibiting, by sex, the per cent of persons in certain age-groups who recovered from whooping-cough, in Michigan, during the year 1899; also the average age and the number of cases included. (Compiled from such reports as stated the ages.)*

Year.	Sex.	Average age of persons who recovered, years.	No. of cases included.	Age.—In periods of years. Per cent of (non-fatal) cases in each period.*										
				All ages.	Under 5 years.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 and over.
1899.	Males	6.2	467	100	47	37	12	1	.6	0	.4	.4	0	1
	Females	6.4	559	100	43	40	11	3	.7	.3	.3	.3	.3	1

TABLE 9.—*Exhibiting, by sex, the per cent of persons in certain age-groups who died of whooping-cough during the year 1899.*

Year.	Sex.	Average age of decedents.	No. of deaths included.	Per cent of deaths in certain age-groups.*					
				All ages.	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 to 24.
1899.	Males	1.1	98	100	96	3	0	1	0
	Females	1.4	94	100	95	4	0	0	1

*On a preceding page, a foot-note to the side head under which this table appears, explains these age-groups.

Duration of sickness from whooping-cough.—The duration of sickness from whooping-cough was given in 764 cases that recovered from this disease and in 57 fatal cases. Table 11 shows that the greatest per cent of non-fatal cases were sick from forty-one to forty-five days.

The average duration of non-fatal cases was 48.1 days for males and 50.5 days for females; for fatal cases the average duration was 18.2 days for males and 27.6 days for females.

TABLE 10.—*Exhibiting, by sex of patient, the duration (in days) of fatal cases of sickness from whooping-cough, in Michigan, during the year 1899. Per cent of deaths arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of whooping cough.											
Year.	Sex.	No. of deaths included.	Duration of sickness:—Per cent of deaths in each period of days.								
			All periods.	1 to 5 days.	6 to 10.	11 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 and over.
1899.	Males	29	100	14	24	24	3	10	3	3	17
	Females	28	100	4	4	25	18	18	0	11	21

TABLE 11.—*Exhibiting, by sex of patient, the duration (in days) of non-fatal cases of sickness from whooping-cough, in Michigan, during the year 1899. Per cent of cases arranged in five-day groups. (Compiled from those reports which stated the length of time the patient was sick.)*

Non-fatal cases of whooping-cough.																	
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of cases in each period of days.														
			All periods.	1 to 15.	16 to 20.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	61 to 65.	66 to 70.	71 to 75.	76 and over.
1899.	Males	333	100	2	3	2	5	6	6	27	10	9	7	7	2	5	10
	Females	431	100	3	2	3	4	4	4	23	9	10	6	9	4	5	14

The lesson of the experience may well be summed up in the constant warning advanced and persisted in by the State Board of Health,—"Prevent the disease by isolation of the first cases, disinfect the sick room and all that comes in contact with the patient," and the number of cases will be lessened, the deaths from whooping-cough will be diminished.

SMALLPOX (VARIOLA) IN MICHIGAN, IN 1899.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health twenty-four outbreaks of smallpox in twenty-one localities in Michigan which resulted in one hundred and thirty-nine cases with six deaths. For the same year (1899) there were reported to the Secretary of State the same number of deaths from smallpox, as were reported to this office.

Success of efforts for the restriction of smallpox.—Of the twenty-four reported outbreaks of smallpox in Michigan in 1899, fifteen, or sixty-two and one-half per cent, were restricted to the house where the first case occurred.

Distribution of smallpox by counties during 1899.—The distribution by counties is shown in Table 1, as follows:

TABLE 1.—*Numbers of reported cases and deaths from smallpox and the numbers per 10,000 persons living in each county in Michigan (from which smallpox was reported) during the year 1899. (Compiled from reports of health officers, etc.)*

Counties.	Estimated population of Michigan for 1899.*	Number of reported		Number per 10,000 population, of		Counties.	Estimated population of Michigan for 1899.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.			Cases.	Deaths.	Cases.	Deaths.
State	2,426,331	139	6	.57	.02	Kent	136,958	1	0	.07	0
Berrien	51,073	49	3	9.59	.59	Lake	5,137	6	0	11.68	0
Calhoun	52,436	13	0	2.48	0	Saginaw	81,314	44	0	5.41	0
Delta	24,177	1	0	.41	0	St. Clair	57,091	1	0	.18	0
Kalamazoo	45,535	8	2	1.76	.44	Wayne	336,645	16	1	.48	.03

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894.

TABLE 2.—*Exhibiting the reported number of outbreaks of smallpox which began, the number which ended, and the number of outbreaks which were present, in each month of the year 1899, in the different local jurisdictions of Michigan.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Number began	1	2	4	0	0	1	0	1	3	6	3	3	24
Number ended	0	1	0	4	2	0	1	0	0	1	7	4	20
Number present	1	3	6	6	2	1	1	1	4	10	12	8	....

Number of outbreaks of smallpox in each month of the year 1899.—The last line of figures, in Table 2, representing the reported number of outbreaks present, is not derived from the preceding two lines, as might be supposed, but is obtained by actual count of the number of outbreaks reported as existing in each month. Frequently the beginning of an outbreak is reported but the end of the outbreak is not reported; and sometimes the month in which the outbreak ended is given without giving the date of the beginning of the outbreak. In either case the outbreak may have begun and ended in the same month, or it may have extended through several months.

The first line of figures in Table 3, shows the number of cases reported sick in any part of each month.

As some of the cases were sick longer than one month they are included in the cases sick in more than one month, therefore the sum of the cases sick in all the months exceeds the total reported cases in 1899.

The last line of figures, in this table (3), shows the per cent the cases sick in each month are of the exact number of cases *reported* to this office for the year 1899.

TABLE 3.—*Exhibiting the number and per cent of cases of smallpox in Michigan in each month during the year 1899. (Includes each case for which the time during which it existed, was stated in the reports. Each of such cases is counted in each month in which, or part of which, the case was reported to have existed.)*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases sick in any part of the month..	9	2	19	24	13	0	0	0	24	39	38	21
Per cent the cases sick in each month were of total reported cases........	.5	1.4	13.7	17.3	9.4	0	0	0	17.3	28.0	27.3	15.1

Source of contagium of cases of smallpox.—Of the one hundred and thirty-nine cases of smallpox reported during the year 1899, the local health officers reported the source of contagium as stated in the description of each outbreak in succeeding pages of this article.

TABLE 4.—*Exhibiting, in certain age-groups, the number of cases and the number of deaths from smallpox; and the per cent that the cases in each group were of all cases.—Compiled from all reports for the year 1899, which stated the ages.*

	Number and per cent of cases and deaths in certain age-groups.									
Ages in groups of years.	All ages.	0 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 and over.
No. of cases................................	*103	26	15	14	16	8	4	8	6	6
Per cent the cases in each group were of all cases................................	100	25.2	14.6	13.6	15.5	7.8	3.9	7.8	5.8	5.8
No. of deaths............................	4	0	1	0	0	1	0	2	0	0
Per cent deaths in each group were of cases in that group....................	3.9	0	6.7	0	0	12.5	0	25.0	0	0

*Does not include those cases or deaths where the age was not stated.

Ages of greatest prevalence of, and mortality from smallpox.—The reports of local health officers in Michigan for the year 1899, gave the ages of one hundred and three persons who were sick with smallpox, and of four persons who died of that disease. Table 4 represents, in certain age groups, the numbers of cases and of deaths from smallpox; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of the cases in that group.

Table 3 shows that the greatest prevalence of smallpox in 1899, occurred in the months of October and November.

Table 4 shows that the greatest number of cases of smallpox occurred in persons under twenty-four years of age.

Smallpox in Benton Harbor city:—In Benton Harbor there were two outbreaks of smallpox in 1899. The first began in March and ended in May, resulting in two cases. The source of contagium in this outbreak was reported by the health officer as follows: “A case was allowed to leave the village of Watervliet, having been pronounced stomach rash by a man named William Witte, a fake doctor from the so-called Independent Medical College of Chicago, and will cost the county nearly $2,000.” After the nature of the disease was known, active measures were taken for its restriction.

The second outbreak began in September and continued until March, 1900. There were thirty-three cases in this outbreak, twenty of which were in 1899 and thirteen in 1900. The health officer reported the source of contagium as follows: “Was brought here by Mrs. Kirkendall, who was exposed at Uniontown, or Henshaw, Ky., while there on a visit.” The health officer reported also that for the first six days the disease was called chicken-pox by the attending physician.

By request of the mayor and health officer of St. Joseph, State Communicable Disease Inspector Geo. E. Ranney, M. D., was sent to investigate this outbreak. On his return he gave the following report of his investigation:—

“Hon. Frank Wells and H. B. Baker, M. D.,
“President and Secretary of the Michigan State Board of Health.

“Gentlemen:—In compliance with your instructions I visited, this day, the ‘Twin Cities’ of Van Buren County, to investigate an outbreak of disease, looked upon by some as smallpox, and by others as another form of eruptive disease. During the early part of the existence of this outbreak, as in most other outbreaks of the disease, there was considerable difference of opinion as to its nature, and these differences were hotly discussed, and some ill feeling was engendered between professional and non-professional people of both cities, Benton Harbor and St. Joseph.

“First arriving at St. Joseph, I was met by the mayor of the city, the Hon. Mr. Church, and Dr. Scott, health officer of that city. These gentlemen showed me every courtesy and gave me all the information they could touching the object of my visit. The mayor went with me to Benton Harbor, and introduced me to Dr. Ryno, the health officer of that city, who showed me three cases of smallpox in the Mills Block, and three cases at another house, which cases I saw through the windows from the outside. The cases were of a non-confluent form, but very typical of smallpox, some in the pustular, some in the desquamative form, and some whose convalescence was nearly complete.

“There have been from nine to twelve cases of the disease in all.

“The history of its inception and spread in Benton Harbor was, as I understood it, as follows:

“Mrs. Kirkendall visited friends in Uniontown, Ky., leaving home August 23 and returning September 10; Mrs. Ward, her sister, accompanied her home from Kentucky, and September 22 was taken with an eruptive disease. She was not very ill and had no physician, and on September 26 started home, stopping on her way to visit friends in Indianapolis, Ind.

“Later the following appeared in the *Indianapolis News:*

“HOW SMALLPOX WAS BROUGHT HERE.

“The health board has learned that Dr. and Mrs. J. A. Viza, who were found afflicted with smallpox last week, contracted the disease from a woman named Mrs. C. H. Ward of Uniontown, Ky. Mrs. Ward visited a Mrs. Kirkendall in Benton Harbor, Michigan, and on her way home stopped here three days. During her stay here she visited Dr. Viza not knowing she had a contagious disease, although eruptions appeared upon her body. When she returned to Kentucky, she received a letter from Miss Kirkendall, of Benton Harbor, saying she had been seized with an eruptive disease which a physician called 'Cuban itch.'

"Quite recently a paper published in Uniontown, Ky., the home of Mrs. Ward, states that an eruptive disease prevailing there and wrongly diagnosed, was undoubtedly smallpox, and that a quarantine had been established and probably within ten days, if no new cases should occur, there would be no danger of its spreading.

"September 29 Mrs. Kirkendall was taken with a fever, and on the third or fourth day following she had an eruption, which at first was called chicken-pox. On October 8 she was examined by the board of health and quarantined. October 12 Mrs. Walsh, living in the next room to Mrs. K., came down with the disease. On the 13th, the day following, Mrs. Kirkendall's housemaid, and on the 16th Mr. Kirkendall, the husband, were both taken with smallpox. Two more cases occurred in the Mills Block, one in the person of Mrs. Benedict and the other in the person of Mr. Hubbard, brother of Mrs. Walsh.

"Rev. Mr. Taylor and daughter have visited the Kirkendall family, and on October 13 the daughter came down with the disease. Also on that date Arthur Vanderbuk and his mother, both living in the Mills Block, came down with the smallpox.

"The nature of the disease is no longer questioned. The boards of health, the mayors of both cities and others in authority, the local papers and the people most interested in the cities, are alive to the importance of a thorough quarantine of all who have the disease or have been exposed to it; also to the necessity of general vaccination and to thorough disinfection of infected buildings, clothing, etc.

"No cases occurred among the school children, but the school rooms have been disinfected, and pupils attending school are required to show a certificate showing that they have been successfully vaccinated.

"Mrs. Bryan left the Mills Block about the time of its quarantine, and went to Albion. Dr. Ryno, with commendable vigilance and foresight, notified the health officer of Albion, and it is reported that she is there ill with a disease, the nature of which is not stated but is in quarantine. Mrs. Johnson went from the Mills Block to Chase, to attend the funeral of her mother, and was quarantined there on a telegram from Dr. Ryno.

"Respectfully submitted,
"GEO. E. RANNEY, *State Inspector.*"

"Lansing, Michigan, October 30, 1899.

Smallpox in Benton township.—There occurred in this township two outbreaks of smallpox in 1899. In the first, which began in March and ended in April, there were seven cases. Relative to this outbreak the health officer reported to this office: "I find the smallpox in our midst. The case came from the paper mill at Watervliet. The young lady was taken with varioloid, and the doctor there called it a case of indigestion, and after she had got better came home just in time to give it to the rest of the family. There are eight quarantined in the house, and everything is being done for their comfort and to restrict the disease."

The outbreak was restricted to the house in which it first appeared.

The one case which constituted the second outbreak of smallpox in Benton Township was reported to have contracted the disease by visiting a case in Benton Harbor before said case had been diagnosed as smallpox.

Quarantine and other restrictive measures were adopted and the outbreak was restricted to the first case.

Smallpox in Coloma village.—In this outbreak there occurred four cases, all in one house. The source of contagium in the first case was reported as unknown. The other three cases were infected from the first. Restrictive measures were adopted in this outbreak and the disease confined to the one house. Vaccination was administered but the health officer reports that it did not work satisfactorily. The cases were all mild.

Smallpox in St. Joseph city.—In this outbreak, which began October 26 and ended November 29, there occurred two cases, one of which died. The source of contagium was reported as: "First patient caught disease in Benton Harbor, Michigan." The second case was infected from first. Both cases were in the same house and the restrictive measures taken prevented the spread of the disease from that house. All infected rooms were thoroughly disinfected with formaldehyde; and all infected clothing, bedding, etc., were burned and stools of patients were disinfected and buried.

Smallpox in Watervliet township.—In this township there occurred two outbreaks of smallpox in 1899. In the first outbreak, which began February 19 and ended April 19, there were reported six cases, two of which proved fatal. Three of the cases were reported as varioloid. All the cases were in the same house. The source of contagium was reported, "Supposed to have come from infected rags at paper mill." The first case was called chicken-pox by the attending physicians. All other cases were infected by exposure to the first case.

The second outbreak in Watervliet Township began December 14, 1899, and ended February 6, 1900. There occurred nine cases in this outbreak,—in two houses, two of these cases were in 1899, the remaining seven in 1900. The source of contagium was reported: "The disease was brought from Benton Harbor by one of the members of the Arndt family." Relative to this outbreak the health officer further reports that the first case was exposed, "By visiting in a house where the disease was present." The other cases were infected, "By direct contagion."

Those sick in the second house were reported to have taken the disease "By the children playing together." [With those of the first house.] At first, proper isolation in this outbreak seems to have been neglected. After the disease had been correctly diagnosed, precautionary measures were taken to avoid its spread; and all infected rooms, clothing, etc., were disinfected with sulphur and formaldehyde.

Smallpox in Watervliet village.—This outbreak, in which there occurred two cases of primary smallpox and three of varioloid, began February 19 and ended in April. The contagium in the first case was "Supposed to have come from infected rags, at paper mill." All the cases were in the same family and the last four were infected from the first case. The health officer reported that all possible precautions were taken to prevent the spread of the disease. After the outbreak was ended, rooms were disinfected with sulphur fumes, infected articles that were not burned were disinfected, and stools of patients treated with carbolic acid and buried.

Smallpox in Battle Creek city.—This outbreak began August 4 and ended November 7, 1899. It resulted in thirteen cases, no deaths. The disease prevailed in two households. The source of contagium in the first case seems to have been doubtful; but was believed to have been brought to Battle Creek in clothing of a family who had recently arrived there from Mexico, and who had had the disease in that country.

Other cases were reported to have been infected by contact with the first case and by a concealed washing taken from the infected house. None of the cases had previously been successfully vaccinated. The health officer reported that every possible precaution was taken to prevent the spread of the disease; that all articles which had been in contact with the patients were either burned or taken to the pest house, and that two old houses where the disease had been, were burned down; and other rooms where patients had been, were disinfected with sulphur fumes and formaldehyde.

Smallpox in Masonville township.—There was but one case in this outbreak. The source of contagium was unknown. The case was quarantined and further spread of the disease thus prevented.

Smallpox in Kalamazoo city.—There occurred an outbreak of smallpox in Kalamazoo city in 1899, which began March 25 and ended May 1, and resulted in six cases and two deaths. The source of contagium in the first case was stated as "Probably contracted from cases at Watervliet—possibly from rags in paper mill." The other five cases were traced to the first case. During the outbreak the disease was present in four households; and the health officer reported that he had had twenty-five houses quarantined; that all rooms occupied by the sick had been disinfected with formaldehyde, and that all clothing and bedding used by the patients, had been burned.

The first case having been reported as measles was probably not isolated in time to prevent the spread of the disease. Following is a synopsis of the history of the cases, supplied by the local health officer:

"1. Mrs. Sloniker, aged 25, ragpicker at Wolverine paper mill (just outside the city limits) took sick March 5th, was treated for measles up to March 10th, when smallpox was diagnosed and patient properly quarantined, but no watchman stationed until March 13, died from hemorrhagic variola March 17. 2. Ella Simmons, aged 17, also ragpicker at the same place, living with the former, was successfully vaccinated March 11, took sick March 21, slow development of disease, moderate intensity, is doing nicely now. 3. Ferry Ryan, aged 8, to whose house Mrs. Sloniker, living only a few doors east, came early in the morning of March 12, while in a delirious condition, Mrs. Sloniker in her nightgown, barefoot, a little shawl over her head, remained there, sitting in a chair, for about fifteen minutes, until she was removed by Dr. Sates, her first medical attendant and poor diagnostician, who lives nearby, to her own house. Little Ferry was asleep in another room during that time. He was vaccinated March 13 without success. Showed the first manifestations of the disease March 24, and is a pretty sick boy at the present time. 4. Dr. Crane (city bacteriologist) saw Mrs. Sloniker in consultation March 10, was successfully vaccinated the same day, had a chill on the evening of March 19, temperature rising to 103 during the next three days, showed a very slight papular eruption on March 23, is doing well now with about ten vesicles on his face and twice as many on his body (mild case of varioloid). 5. Bessie Spalding, aged 20, paper-assorter at Wolverine paper mill (the rag-picking and paper-sorting is done in the same room, although on opposite sides, but girls intermingle) took sick March 10, was reported March 14, had a regular attack of smallpox and is now convalescent. 6. Fred Spalding, aged 8, brother of the former, was successfully vaccinated March 14, took sick March 22, and is now suffering from a mild attack of varioloid."

Smallpox in Kalamazoo township.—In this outbreak, which began March 9 and ended April 28, there were two non-fatal cases, one of which was varioloid. In the first case, the disease was contracted by "working in paper mill with Mrs. Frankie Sloniker, who came down with the disease in Kalamazoo city." The second case was infected by first. Both cases were in one house to which the disease was confined. After the outbreak was ended, all rooms occupied by the patients, and all articles which came in contact with the sick were burned, or disinfected with formaldehyde.

Smallpox in Grand Rapids city.—In this outbreak there was one non-fatal case, taken sick in October. Relative to the source of contagium the health officer reported: "This patient had been handling old rags in his occupation and might have taken the disease from that source." The health officer reported also, that thorough isolation and disinfection and "pretty general" vaccination were practiced.

Smallpox in Chase township.—This outbreak began in October and ended in December. There occurred six non-fatal cases. The contagium was reported as brought from Benton Harbor by the first case, and all other cases were infected from the first. The disease spread to a second household. After the outbreak, all infected rooms, clothing, bedding, etc., were disinfected.

Smallpox in Brant township.—Two non-fatal cases, one of which was reported varioloid, occurred in this outbreak. The source of contagium was unknown. Both cases were in one household, the second case having taken the disease by contact with the first.

Smallpox in Carrollton township.—One case of varioloid was the extent of this outbreak. The health officer reported that all necessary restrictive and preventive measures were taken.

Smallpox in Chesaning township.—In this outbreak there were eight non-fatal cases, all in one family, in one household. The source of contagium was reported as: “Caught it from his brother's family in Maple Grove township.” The first case, the mother of the family, was believed to have been exposed to the disease in Maple Grove, by washing clothes of “infected patients.” Isolation and disinfection were enforced.

Smallpox in Maple Grove township.—This outbreak began September 1 and ended November 7. During that time there occurred thirty non-fatal cases, twenty-four of which were reported as varioloid. The contagium was brought from Cleveland, Ohio; and owing to ignorance of the nature of the disease, and assertions of attending physicians, that it was not dangerous, for a time there was no restriction to intercourse between the sick and their friends, and great opposition to quarantine when established. The following letter, dated October 20, 1899, received at this office from Health Officer Jacob S. Shoemaker, M. D., gives a history of the beginning and progress of the outbreak:

> “Smallpox broke out in Maple Grove Township at Hy Wellings and the disease was communicated to his brother John Wellings of Chesaning Township. The disease was brought here from Cleveland, Ohio, by some relative of Hy Wellings. The child took sick coming. They employed no doctor and visited considerably. After they left, the disease broke out in Wellings' family and Emmendorfer's but very light in latter and they did not employ a doctor until the second outbreak in their family. Wellings employed Dr. Bertram of Layton Corners, who did not call it smallpox nor would until after they had got well. Yet in the family there was a case of the confluent type. Some time during the progress of the case at Wellings', Dr. Stuart of Chesaning (the health officer of Chesaning Township) was called in counsel and pronounced it smallpox. C. C. Speer used every effort to quarantine but not very successfully, as the attending physician persisted in telling them there was no danger.
>
> “About three weeks after it broke out in Wellings' family I was called to Emmendorfer's and found a case of confluent type, and three of discrete, two were convalescent and had not been very sick except the two first days.
>
> “I have not had an opportunity of seeing any in the beginning of the first stage, but they all complain of severe headache and backache, with high fever which leaves about the third day when the rash appears. Vomiting in the majority of cases. Two of the cases at Emmendorfer's had a pronounced second fever when the pustular stage appeared.
>
> “The majority of the cases are exceedingly typical, but what makes the people disposed to think it is not smallpox is that the great majority are able to be up and out of doors and feeling good while they are more or less broken out. And they say no one has died and they don't believe it is smallpox. Yet our quarantine is fairly good. The last spread was due to a family (German, as all the families afflicted are) keeping their sickness secret so they would not be quarantined. One of the number was on the streets of this village last Saturday with his face quite full of the eruption. He had been quite sick but when the eruption came, felt better, but came to town to see the doctor and ask ‘if he had this smallpox.’
>
> “I am looking for quite an outbreak in this vicinity next week. The town board are building a hospital and getting ready for it. If the disease gets away from us this time I think the State will have to take hold of it.”

October 26, Dr. Shoemaker again wrote as follows:

> “Relative to the smallpox outbreak in Maple Grove Township, there are a good many who persist in calling it chicken-pox and some families who have had it only in a light form agree with them, of course. Some doctors have made a superficial examination of some of the cases and called it chicken-pox. Now, in order that cases may be reported to the health officer promptly, it is necessary that people believe it to be what it is, viz., smallpox. Also in order that each family's premises may be properly disinfected it is necessary to have their coöperation. In view of these facts I believe it is necessary that State officials take action, as their decision will have more weight with the people at large, otherwise the disease is liable to be covered and lurk in the country till cold weather and then become epidemic. I do not know as it is necessary for State quarantine, although some

think that it is, but an official here who would examine into this outbreak, would materially strengthen the present quarantine.

"There have been no new cases reported the last ten days; but it is possible that some families, believing it to be only chicken-pox, are keeping quiet to avoid quarantine. The last four cases (in three families) were only accidentally discovered when one had recovered, one was in the vesicular and two in the pustular stage.

"Cannot you give us the above named needed assistance immediately?"

Dr. Geo. E. Ranney, State Communicable Disease Inspector, was instructed to proceed to the stricken district to investigate the outbreak and render assistance to the local officials in their endeavors to stamp out the disease. Following is his report on the subject:

"H. B. Baker, M. D.,
"Secretary of the Michigan State Board of Health.

"Dear Sir:—As per your instructions I went to Saginaw, November 1st inst., to investigate an outbreak of smallpox in that city. A meeting of the city board of health was called on the 2d inst., to confer with me as to the disease and the best means of preventing its further spread. By request of the local board I visited two cases believed to have the disease, who were quarantined in a portable house, erected 1,200 feet from any other building, on what is known as the Webber plat, East Side.

"I found there two brothers, aged about twenty-four and twenty-one respectively. The former having been quarantined since October 28, and his brother, with whom he had been associated, immediately after. The older brother consulted Dr. Pease, for illness accompanied with an eruption, which the doctor diagnosed as varioloid, and called the chairman of the board of health, Dr. Campbell, who confirmed his diagnosis.

"On examination of the patients myself, I found a well-marked smallpox eruption, in the case of the older brother; and, while there was on the face and body of the younger brother an eruption, it was less characteristic of smallpox, and taken alone, without knowledge of his exposure to smallpox, the diagnosis would have been doubtful.

After my examination of the two cases, I again met the city board of health, and by resolution they recommended a strict quarantine to be maintained till all danger is past, and that a general vaccination be urged, and that all school children attending school, be required to furnish a certificate showing that they have been properly vaccinated.

"The name of the brothers having the disease is Hillus, who lived in Buena Vista, just east of the city corporation, and came from Verne P. O., near the Verne coal mines.

"The family to whom the Hillus boys belong, living in the township of Buena Vista, was immediately put in quarantine, and the supervisor of that town, John G. Winkler, was present at the conference of the board of health, and it was recommended that he maintain the quarantine of the Hillus family two weeks longer.

"On the 3d inst. I visited New Lathrop, and in company with the chairman of the board of health (of both townships, Hazelton and Maple Grove), Dr. J. S. Shoemaker, health officer, and Hon. C. C. Speer, supervisor of Maple Grove township, visited about thirty people who are all convalescent from smallpox or varioloid. Six of the cases were well-marked smallpox, and while all of the others had been somewhat ill with a febrile affection and exanthematic disease, the cases were so extremely mild as to have rendered it extremely difficult from the symptoms alone to have diagnosed it as varioloid, although the conditions were such as leave no doubt as to its identity.

"The history of the outbreak and spread of the disease, judging from all the facts I could gather, were as follows:

"A lady, and her child six years old, living in Cleveland, Ohio, came to Maple Grove, to visit the family of Henry Willing. On their way from Ohio the child was taken ill with a fever, and two or three days later, broke out with an eruption. Within three weeks, Mrs. Willing and six children, all the members of the family at home, except Mr. Willing, had the disease. One of the sons had varioloid in its confluent form, leaving his face badly pitted. Mr. Willing, the only member of the family who was exempt from the disease, was immune from having had the varioloid years before. A son of the Willing family had been away from home, and about ten days after returning, had the disease.

"Children from other families in the neighborhood visited the Willing family, and took the disease, and they in turn conveyed it to others, and all the cases could be traced back to that source.

"The disease spread considerable, because of the tardiness in calling a physician to diagnose and treat the cases.

"When Dr. Shoemaker, health officer, first saw some of the cases he recognized the nature of the disease at once, and he, in coöperation with Supervisor Speer, of Maple Grove, instituted a most rigid quarantine, going so far as to barricade the roads, confining the residents of the infected district within its bounds.

"No new cases have appeared for the past three weeks. The patients were all convalescent and ready for disinfection, now about to be done, after which the quarantine will be raised.

"The skill, energy and vigilance displayed by Dr. Shoemaker, and the earnest coöperation of Supervisor Speer, are worthy of special commendation.

"Three weeks ago a man came to New Lathrop, to consult a doctor for an eruption on his face, when Dr. Shoemaker immediately recognized it as varioloid, took charge of him, and employed carpenters to build a house in the woods, immediately, they having to do most of the work during the night, and the man was immediately quarantined in this house till all danger was past.

"Respectfully submitted,
"GEO. E. RANNEY.

"Lansing, Michigan,
"November 4, 1899."

Smallpox in Saginaw city.—Two non-fatal cases of varioloid were reported from this locality. The persons sick were residents of the township of Buena Vista, who had contracted the disease by intercourse with cases at Maple Grove and carried the contagium to Saginaw. Restrictive measures were successfully adopted so that the outbreak was restricted to the first two cases. Dr. Ranney, State Communicable Disease Inspector, investigated this outbreak and reported relative thereto as stated above.

Smallpox in Marine City.—In this outbreak there was one non-fatal case. Relative to the source of contagium the health officer says: "Patient came direct from Detroit and was taken sick following morning."

All measures necessary to prevent the spread of the disease were taken.

Smallpox in Delray village.—There occurred one non-fatal case in this outbreak. The patient contracted the disease at Walkerville, Ont.

Smallpox in Redford township.—One non-fatal case was the extent of this outbreak, although the health officer feared cases would be numerous on account of late diagnosis and many exposures. Relative to mode of introduction of the disease into his jurisdiction the health officer wrote: "The facts are the patient came out from the city of Detroit about to enter upon a run of smallpox."

Smallpox in Detroit.—There were fourteen cases, one death, from smallpox reported from Detroit in 1899. Nine of these cases and the one death formed part of an outbreak which began in 1898 and was mentioned in the article on smallpox for that year, published in the annual report of this Board for 1899. The other five non-fatal cases are reported as a separate outbreak the contagium of which was believed to have been brought from Canada. Relative to this outbreak, November 11, 1899, Dr. Gibbes wrote to the Secretary of this Board as follows:

> "I have just returned from an investigation into the epidemic prevailing in several townships of Essex County, Ontario. I find what seems to me to be an attenuated form of smallpox. An expert has been sent to look into these cases and they have been placarded as smallpox but that is all that has been done, and people are going in and out of the placarded houses as they please. I think it my duty to ask you to telegraph to the Provincial Board of Health of Ontario, at once, and request them to have proper isolation and quarantine established as, if this is not done, I shall have to quarantine against the Canadian frontier to prevent the disease from getting into this city."

December 4, 1899, Health Officer Gibbes of Detroit telephoned to Secretary Baker that in the municipality of Tilbury, Canada, there is nothing effective being done to restrict the spread of smallpox, that people with scabs are going about freely, even going to school with scabs on their faces, and that he wanted them stirred up about it.

Secretary Baker communicated the statements of Dr. Gibbes to Dr. Bryce, Secretary of the Provincial Board of Health, of Ontario, who, December 8, 1899, replied as follows:

> "Your letter of December 4, stating what Dr. Gibbes had said to you over the telephone, has been received. It is not necessary for me to defend the action of Ontario municipalities and provincial officers in dealing with smallpox; the history of the past eighteen years is sufficient for that; but when I learn upon what reputable basis Dr. Gibbes makes such statements I shall be prepared to answer them. It would be worth while, however, for you to have substantiated assertions such as that contained in Dr. Gibbes' previous letter before you hastily assume their correctness. I may state that so far as known Dr. Gibbes has never been in the infected townships of Essex County, and was unable to state to our inspector what cases he had examined. It would better comport with the important duties he has

to discharge if he would care for the cases he has in Detroit of a disease returned to you as suspiciously like smallpox which seems to have, during the past fourteen months, kept our health officers on the border tolerably busy in suppressing offshoots therefrom. When the record of deaths from smallpox in Detroit during the past ten years is compared with the record for all Ontario to the disadvantage of the latter, I shall then be prepared to take any further notice of communications received directly or indirectly from that gentleman.

"I have the honor to be,

"Your obedient servant,
"P. H. BRYCE, *Secretary.*

"DR. HENRY B. BAKER.
"Secy. State Board of Health,
"Lansing, Mich."

Interstate notifications of smallpox.—In compliance with resolutions adopted by the National Conference of State and Provincial Boards of Health at Toronto, 1886, and Washington, 1887, notifications of the presence of smallpox in twenty-five states and provinces were received at this office during the year 1899, as follows: Montreal, Canada, January 9-November 20, 252 cases, 1 death; Toronto, Canada, January 1-December 10, 220 cases, 16 deaths; Colorado, January, 60 cases; Connecticut, January 16-July, 3 cases; Florida, January 23, 11 cases; Illinois, January-March, 56 cases; Indiana, January 25, 16 cases; Iowa, April, 5 cases, 1 death; Kansas, October, 5 cases; Louisiana, February-December, 296 cases, 3 deaths; Maine, February 3, 170 cases; Maryland, December, 1898,-March 5, 1899, 16 cases; Massachusetts, May, 10 cases; Minnesota, April-July 1, 56 cases, 1 death; Missouri, February 13, 48 cases, 7 deaths; New Jersey, January-June, 33 cases; Ohio, February 7, 288 cases, 1 death (since the beginning of this outbreak, April 6, 1898, 955 cases have been reported); Nebraska, February 1, 53 cases; North Carolina, January-February, 4 cases; Pennsylvania, January-December, 1,160 cases, 14 deaths; Rhode Island, February-June, 4 cases; South Carolina, January, 45 cases; Tennessee, January 30-March, 94 cases; West Virginia, January 23, 1 case; Wisconsin, February 7-January 13, 27 cases, 6 deaths.

CHICKEN-POX (VARICELLA) IN MICHIGAN IN 1899.

During the year ending December 31, 1899, the presence of chicken-pox at twenty localities in Michigan, was reported to the State Board of Health. Two hundred and one cases of the disease were reported to have occurred in these twenty localities, as follows: Mancelona village, Antrim County, 1 case; Bainbridge Township, Berrien County, 1 case; Elmira Township, Benzie County, 2 cases; Coldwater city, Branch County, 14 cases; Albion city, Calhoun County, 4 cases; Watertown Township, Clinton County, 3 cases; Osceola Township, Houghton County, 2 cases; Kalamazoo city, Kalamazoo County, 43 cases; Grand Rapids city, Kent County, 61 cases; Macon Township, Lenawee County, 22 cases; Memphis Village, Macomb County, 1 case; Ontonagon Village, Ontonagon County, 4 cases; Vanderbilt Village, (Corwith Township), Otsego County, 1 case; Saginaw city, Saginaw County, 21 cases; Emmet Village, St. Clair County, 4 cases; Kimball Township, St. Clair County, 1 case; Colon Township, St. Joseph County, 2 cases; Three Rivers city, St. Joseph County, 2 cases; Nankin Township, Wayne County, 3 cases; Springwells Township, Wayne County, 9 cases.

VACCINATION.

September 8, 1899, the health officer of Grosse Point Farms, wrote to the Secretary of this Board as follows:

> "Will you kindly inform me in regard to the vaccination of school children and what authority I have in the matter?
>
> "Very few of the children attending the schools here are vaccinated."

In reply to the above quoted letter, the Secretary of this Board, September 14, 1899, wrote as follows:

> "Your letter of September 8, relative to the vaccination of school children, has been received. Under Act 146, Laws of 1879, the local board of health may direct its health physician to offer vaccination, with bovine vaccine virus, to every child not previously vaccinated, * * * but at the expense of such city, village, or township, as the case may be.—Howell's Statutes, §1685.
>
> "The local board of health may offer, but cannot enforce vaccination. There is no State law compelling vaccination, but the school board may pass regulations which will keep children out of school unless they have been vaccinated.
>
> "I enclose a pamphlet on page three of which a part of the law bearing on this subject is marked."

In order to prevent the breaking up of schools, school boards may (under Section 4682, Compiled Laws 1897) require of pupils certificates of successful vaccination within the past five years, or evidence of revaccination with virus known to be effective; and teachers may be instructed to compare the certificates with the lists of pupils to learn whether or not all have complied and if not to report the facts to the local health officer.

CONSUMPTION IN MICHIGAN—YEAR ENDING DECEMBER 31, 1899.

During the year ending December 31, 1899, there were reported to the Secretary of the State Board of Health 2,975 cases including 2,516 deaths from consumption in Michigan. These reports were received from 920 localities in the State. These numbers are probably less than the actual number of consumption-infected localities in Michigan, much less than the actual number of deaths, and very much less than the actual number of cases. Many cases are of long duration, and in the early stages and sometimes in the latest stages are not under the care of a physician; as a consequence many of these cases are not reported. From many localities only the deaths from consumption are reported; therefore the apparent ratio of deaths to cases is much too high.

CONSUMPTION IN 1899, COMPARED WITH PREVIOUS YEARS.

According to the reports made to the Secretary of the State Board of Health.—The compilation of information relative to the prevalence of consumption in Michigan, as reported to the office of the Secretary of the State Board of Health, was made for the first time for the year 1893. Table 1 shows the reported numbers of cases and deaths from consumption, the number of localities where the disease was reported present, the average numbers of cases and deaths per locality, and the deaths per 100 cases, for each of the years 1893-99.

TABLE 1.—CONSUMPTION IN MICHIGAN.—*Numbers of reported cases and deaths, number of localities in which they occurred, average number of cases and deaths per locality, and the per cent of reported cases which proved fatal, for each of the 7 years, 1893-99.*

Year.	Reported localities.	Reported cases.	Average cases per locality.	Reported deaths.	Average deaths per locality.	Deaths per 100 cases.
1893	525	1,988	3.8	1,509	2.9	75.9
1894	590	2,060	3.5	1,581	2.7	76.7
1895	626	2,068	3.3	1,613	2.6	78.0
1896	512	2,198	4.3	1,454	2.8	66.2
1897	664	1,715	2.6	1,396	2.1	81.4
1898	922	3,041	3.3	2,727	3.0	89.7
1899	920	2,975	3.2	2,516	2.7	84.6

According to the reports made to the Secretary of State.—The reports to the Secretary of the State Board of Health, while useful for many purposes, are not yet useful for comparing the deaths in one year with the deaths in another year, for the reasons already stated. On the other hand, not all deaths are reported to the Secretary of State, but probably the omissions were about the same in every year until the new law for the registration of deaths took effect, in the latter part of 1897; therefore the statistics of the State Department are useful for comparing one year with another, up to the close of the year 1896.

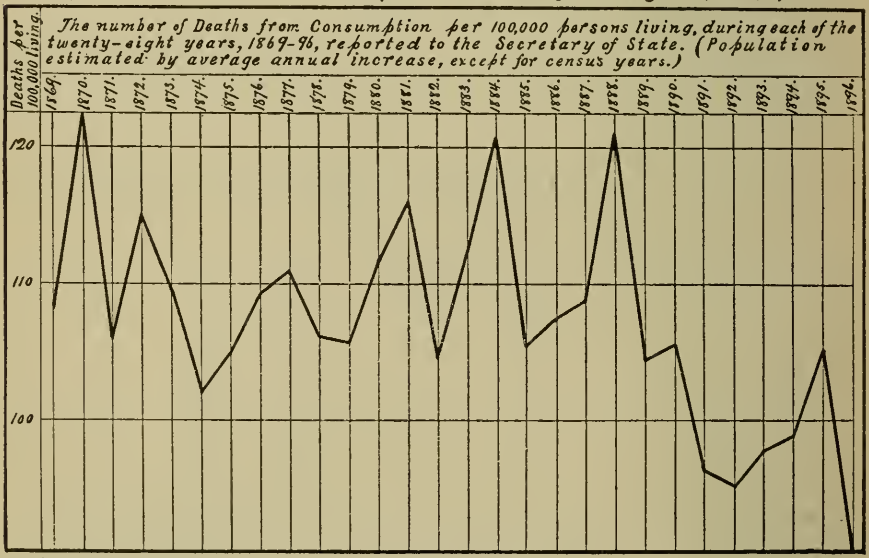
The following table (2) stating the number of deaths from consumption per 100,000 persons living, reported to the Secretary of State, probably quite accurately represents the annual fluctuations of, but not the total deaths from consumption in Michigan during the twenty-eight years, 1869-96.

TABLE 2.—*Exhibiting the number of reported deaths from consumption per 100,000 persons living in Michigan in each of the 28 years, 1869-96. Compiled from the Secretary of State's Vital Statistics of Michigan. (Population for intercensal years estimated by average annual increase based on National and State censuses.)*

Year.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879	1880.	1881.	1882.
Deaths	108.1	122.5	106.0	115.1	109.6	102.0	104.9	109.2	110.9	106.1	105.6	111.7	116.1	104.4
Year.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.
Deaths	112.3	120.8	105.3	107.3	108.7	121.0	104.3	105.4	96.3	95.2	97.7	98.4	105.1	90.4

The accompanying diagram [Plate 937] graphically represents the figures contained in Table 2.

Reported Deaths from Consumption in Michigan, 28 years, 1869-96.



[PLATE 937.]

Table 2 and accompanying diagram do not show the number of reported deaths from consumption for the year 1897, because the reports to the Secretary of State for that year have not yet been compiled. The reports for the years 1898 and 1899 have been compiled, and the results of the compilations are available for use; but as the reports for those years were made under the new registration law, provided for by Act No. 217, Laws of 1897, the results of the compilations for those years are not comparable with results of compilations of reports made under the old law and shown in Table 2.

Registration reports to the Secretary of State made under the new law, and the deaths therein reported, classified by the Bertillon system, show that in 1898 there occurred in Michigan 2,153 deaths from consumption—tuberculosis of lungs—a death-rate from that disease of 91.5 per 100,000 of the total population; and that in 1899 there occurred in Michigan, from the same disease, 2,098 deaths, showing a death-rate of 86.5 per 100,000 of the total population of the State, a decrease of 5 per 100,000 in 1899 as compared with 1898.

By Table 2, and more readily by the diagram [Plate 937], it may be seen that there was a remarkable and unprecedented decrease in the death-rate from consumption in Michigan in 1891, compared with any previous year; it was the first time that the disease had ever decreased so much, and the decrease occurred at a time when influenza was epidemic in this country, and the statistics for the Eastern States show an increase in the death-rate from consumption, which increase was attributed to the influence of the epidemic influenza.

Possible causes for the above-mentioned decrease in consumption in Michigan, are explained in the annual report of this Board for 1898, page 319.

Sickness-rates from reported consumption in 1899.—Table 3 shows the reported sickness and sickness-rates from consumption by counties in the State. For reasons explained in the first paragraph of this article little reliance can be placed on the completeness of the reports of cases on which these particular sickness-rates are based.

Death-rates from reported consumption in 1899.—Table 3 shows that the death-rate from consumption reported for the whole State in 1899 was 10.37 deaths per 10,000 persons living in the State. Converting this into the form of statement used above with reference to the State Department statistics, it becomes 103.7 deaths per 100,000 persons living; and this differs very much from the rate shown by the State Department. The explanation of this difference is that, whereas the statement by the Department of State includes *only* deaths from consumption of *lungs* (2,098), Table 3 includes *all* deaths from consumption *reported to this office* (2,516) irrespective of the part of the body in which the disease was located.

The county having the highest death-rate (25.49 deaths per 10,000 of population) was Alger. That having the lowest death-rate (1.86) was Ontonagon.

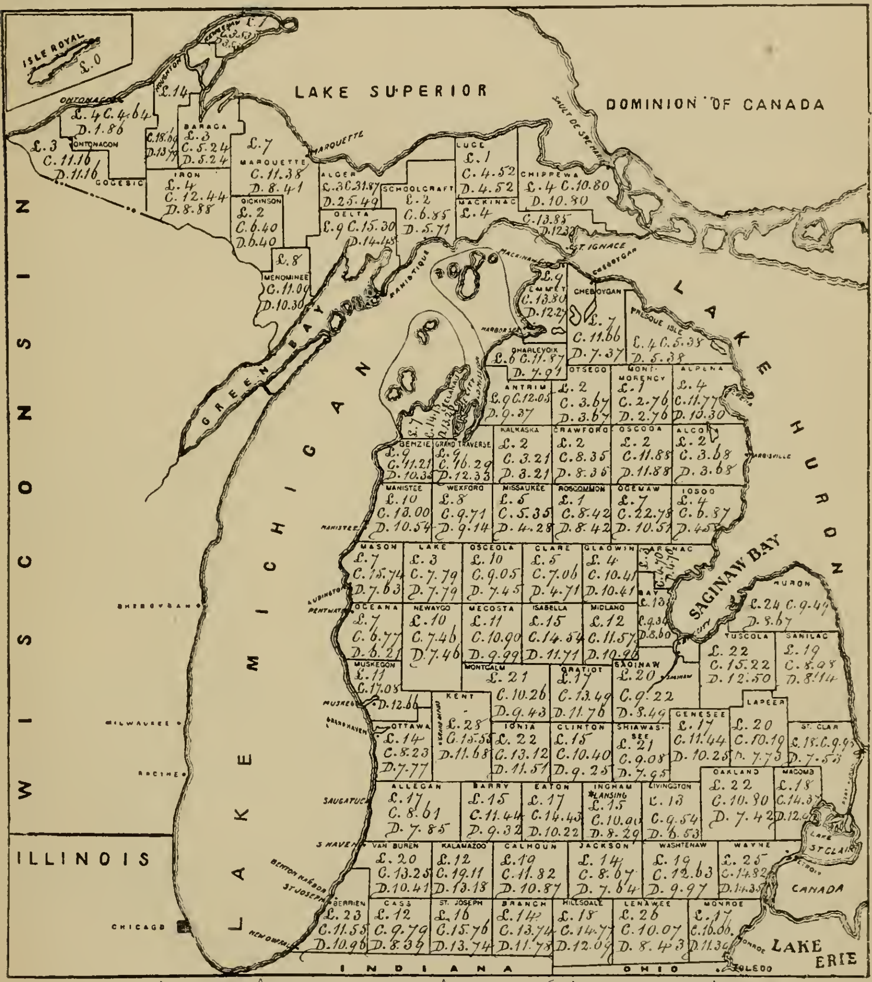
TABLE 3.—*Numbers of cases and deaths reported from* **consumption;** *also the reported cases and deaths from that disease, per 10,000 persons living in each county in Michigan during the year 1899. (Compiled from reports of health officers.)*

Counties.	Estimated population for 1899.*	Number of reported		Number per 10,000 population, of	
		Cases.	Deaths.	Cases.	Deaths.
State.........	2,426,331	2,975	2,576	12.26	10.37
Alcona.......	5,429	2	2	3.68	3.68
Alger........	1,569	5	4	31.87	25.49
Allegan......	39,474	34	31	8.61	7.85
Alpena.......	20,387	24	21	11.77	10.30
Antrim	14,943	18	14	12.05	9.37
Arenac.......	8,518	4	4	4.70	4.70
Baraga.......	5,727	3	3	5.24	5.24
Barry	23,594	27	22	11.44	9.32
Bay	67,419	63	58	9.34	8.60
Benzie	11,596	13	12	11.21	10.35
Berrien.......	51,073	59	56	11.55	10.96
Branch	25,477	35	30	13.74	11.78
Calhoun......	52,436	62	57	11.82	10.87
Cass.	21,455	21	18	9.79	8.39
Charlevoix...	12,637	15	10	11.87	7.91
Cheboygan...	16,293	19	12	11.66	7.37
Chippewa	19,451	21	21	10.80	10.80
Clare.........	8,499	6	4	7.06	4.71
Clinton	25,953	27	24	10.40	9.25
Crawford	2,395	2	2	8.35	8.35
Delta.........	24,177	37	35	15.30	14.48
Dickinson ...	15,635	10	10	6.40	6.40
Eaton	33,273	48	34	14.43	10.22
Emmet.......	13,045	18	16	13.80	12.27
Genesee	41,957	48	43	11.44	10.25
Gladwin	5,765	6	6	10.41	10.41
Gogebic......	15,229	17	17	11.16	11.16
Gd. Traverse.	22.715	37	28	16.29	12.33
Gratiot.......	28,911	39	34	13.49	11.76
Hillsdale.....	29,787	44	36	14.77	12.09
Houghton....	55,124	103	76	18.69	13.79
Huron	36,895	35	32	9.49	8.67
Ingham......	42,218	46	35	10.90	8.29
Ionia.........	37,344	49	43	13.12	11.51
Iosco.........	8,735	6	4	6.87	4.58
Iron..........	5,628	7	5	12.44	8.88
Isabella......	24,758	36	29	14.54	11.71
Jackson......	48,415	42	37	8.67	7.64
Kalamazoo...	45,535	87	60	19.11	13.18
Kalkaska	6,240	2	2	3.21	3.21
Kent.........	136,958	213	160	15.55	11.68
Keweenaw...	2,829	1	1	3.53	3.53
Lake.........	5,137	4	4	7.79	7.79
Lapeer.......	28,460	29	22	10.19	7.73
Leelanau....	11,310	16	15	14.15	13.26
Lenawee.....	48,657	49	41	10.07	8.43
Livingston...	19,911	19	13	9.54	6.53
Luce.........	2,214	1	1	4.52	4.52
Mackinac....	6,496	9	8	13.85	12.32
Macomb	34.105	49	44	14.37	12.90
Manistee	28,469	37	30	13.00	10.54
Marquette...	40,418	46	34	11.38	8.41
Mason........	20,968	35	16	15.74	7.63
Mecosta......	22,019	24	22	10.90	9.99
Menominee..	25,248	28	26	11.09	10.30
Midland......	16,419	19	18	11.57	10.96
Missaukee...	9,339	5	4	5.35	4.28
Monroe......	34,236	55	39	16.06	11.39
Montcalm ...	36,059	37	34	10.26	9.43
Montmore'cy	3,627	1	1	2.76	2.76
Muskegon ...	33,963	58	43	15.02	11.19
Newaygo.....	17,436	13	13	7.46	7.46
Oakland......	44,465	48	33	10.80	7.42
Oceana	17,725	12	11	6.77	6.21
Ogemaw	5,707	13	6	22.78	10.51
Ontonagon ..	10,769	5	2	4.64	1.86
Osceola......	18,781	17	14	9.05	7.45
Oscoda.......	1,683	2	2	11.88	11.88
Otsego.......	5,447	2	2	3.67	3.67
Ottawa.......	43,739	36	34	8.23	7.77
Presque Isle.	7,441	4	4	5.38	5.38
Roscommon.	1,187	1	1	8.42	8.42
Saginaw......	81,314	75	69	9.22	8.49
Sanilac	35,640	32	29	8.98	8.14
Schoolcraft.	8,763	6	5	6.85	5.71
Shiawassee...	35,232	32	28	9.08	7.95
St. Clair	57,091	57	43	9.98	7.53
St. Joseph ...	24,751	39	34	15.76	13.74
Tuscola	36,792	56	46	15.22	12.50
Van Buren...	31,707	42	33	13.25	10.41
Washtenaw..	45,133	57	45	12.63	9.97
Wayne.......	336,645	499	483	14.82	14.35
Wexford.....	17,508	17	16	9.71	9.14

*Population estimated by average annual increase (arithmetical method), based on U. S. Census of 1890 and the State Census of 1894. Computed in the office of the State Board of Health.

DISTRIBUTION OF CONSUMPTION IN MICHIGAN IN 1899:

BY COUNTIES, THE REPORTED CASES AND DEATHS PER 10,000 INHABITANTS. INCLUDES ALL SUCH DEATHS REPORTED TO THE STATE DEPARTMENT.


ISLE ROYAL L.0
LAKE SUPERIOR
DOMINION OF CANADA
SAULT DE STE. MARIE
KEWEENAW L.7 C.3.53 D.3.5
HOUGHTON L.14 C.18.69 D.13.79
ONTONAGON L.4 C.4.64 D.1.86
GOGEBIC L.3 C.11.16 D.11.16
BARAGA L.3 C.5.24 D.5.24
IRON L.4 C.12.44 D.8.88
MARQUETTE L.7 C.11.38 D.8.41
DICKINSON L.2 C.6.40 D.6.40
MENOMINEE L.8 C.11.09 D.10.30
ALGER L.3 C.31.87 D.25.49
DELTA L.9 C.15.30 D.14.48
SCHOOLCRAFT L.2 C.6.85 D.5.71
LUCE L.1 C.4.52 D.4.52
MACKINAC L.4 C.13.85 D.12.32
CHIPPEWA L.4 C.10.80 D.10.80
MARQUETTE
MANISTIQUE
ST. IGNACE
MACKINAW CITY
CHEBOYGAN
EMMET L.9 C.13.80 D.12.27
HARBOR SPRINGS
CHEBOYGAN L.7 C.11.66 D.7.37
PRESQUE ISLE L.4 C.5.38 D.5.38
CHARLEVOIX L.6 C.11.87 D.7.91
ANTRIM L.9 C.12.05 D.9.37
OTSEGO L.2 C.3.67 D.3.67
MONTMORENCY L.1 C.2.76 D.2.76
ALPENA L.4 C.11.77 D.10.30
LEELANAU L.7 C.14.15 D.13.20
TRAVERSE CITY
BENZIE L.9 C.11.21 D.10.35
GRAND TRAVERSE L.9 C.16.29 D.12.33
KALKASKA L.2 C.3.21 D.3.21
CRAWFORD L.2 C.8.35 D.8.35
OSCODA L.2 C.11.88 D.11.88
ALCONA L.2 C.3.68 D.3.68
HARRISVILLE
MANISTEE L.10 C.13.00 D.10.54
WEXFORD L.8 C.9.71 D.9.14
MISSAUKEE L.5 C.5.35 D.4.28
ROSCOMMON L.1 C.8.42 D.8.42
OGEMAW L.7 C.22.78 D.10.51
IOSCO L.4 C.6.87 D.4.5
MANISTEE
MASON L.7 C.15.74 D.7.63
LAKE L.3 C.7.79 D.7.79
OSCEOLA L.10 C.9.05 D.7.45
CLARE L.5 C.7.06 D.4.71
GLADWIN L.4 C.10.41 D.10.41
ARENAC L.3 C.4.70 D.4.70
LUDINGTON
PENTWATER
OCEANA L.7 C.6.77 D.6.21
NEWAYGO L.10 C.7.46 D.7.46
MECOSTA L.11 C.10.90 D.9.99
ISABELLA L.15 C.14.54 D.11.71
MIDLAND L.12 C.11.57 D.10.96
BAY L.13 C.9.34 D.8.60
SAGINAW BAY
HURON L.24 C.9.44 D.8.67
MUSKEGON L.11 C.17.08 D.12.66
MONTCALM L.21 C.10.26 D.9.43
GRATIOT L.17 C.13.49 D.11.76
SAGINAW L.20 C.9.22 D.8.49
TUSCOLA L.22 C.15.22 D.12.50
SANILAC L.19 C.8.98 D.8.14
MUSKEGON
GRAND HAVEN
KENT L.28 C.15.55 D.11.68
GRAND RAPIDS
OTTAWA L.14 C.8.23 D.7.77
IONIA L.22 C.13.12 D.11.51
CLINTON L.15 C.10.40 D.9.25
SHIAWASSEE L.21 C.9.08 D.7.95
GENESEE L.17 C.11.44 D.10.25
LAPEER L.20 C.10.19 D.7.73
ST. CLAIR L.18 C.9.95 D.7.58
PORT HURON
SAUGATUCK
ALLEGAN L.17 C.8.61 D.7.85
BARRY L.15 C.11.44 D.9.32
EATON L.17 C.14.43 D.10.22
INGHAM LANSING L.15 C.10.90 D.8.29
LIVINGSTON L.13 C.9.54 D.6.53
OAKLAND L.22 C.10.90 D.7.42
MACOMB L.18 C.14.37 D.12.4
LAKE ST. CLAIR
S. HAVEN
BENTON HARBOR
ST. JOSEPH
NEW BUFFALO
VAN BUREN L.20 C.13.25 D.10.41
KALAMAZOO L.12 C.19.11 D.13.18
CALHOUN L.19 C.11.82 D.10.87
JACKSON L.14 C.8.67 D.7.64
WASHTENAW L.19 C.12.63 D.9.97
WAYNE L.25 C.14.82 D.14.35
DETROIT
CANADA
BERRIEN L.23 C.11.55 D.10.96
CASS L.12 C.9.79 D.8.39
ST. JOSEPH L.16 C.15.76 D.13.74
BRANCH L.14 C.13.74 D.11.78
HILLSDALE L.18 C.14.77 D.12.09
LENAWEE L.26 C.10.07 D.8.43
MONROE L.17 C.16.66 D.11.34
MONROE
LAKE ERIE
TOLEDO
INDIANA
OHIO
ILLINOIS
WISCONSIN
LAKE MICHIGAN
LAKE HURON
GREEN BAY
SHEBOYGAN
MILWAUKEE
RACINE
CHICAGO

L.= Localities; C.= Cases per 10,000 population; D.= Deaths per 10,000 population.

[PLATE 1069.]

TABLE 4.—*Exhibiting, by months, the number of deaths from consumption that were reported to have occurred in Michigan in the year 1899; also the average for the five years 1894-98. (Compiled from such reports to the State Board of Health, as stated the time of death.)*

Year.	Total number.	Number of deaths for each month.											
		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1899	2,387	205	237	240	213	240	166	174	179	178	178	172	205
Av. 5 years, 1894-98	1,069	81	80	78	92	94	78	66	79	71	108	113	128

Table 4 shows that for the five years, 1894-98, the maximum number of deaths from consumption occurred in the month of December; and the minimum number in July.

Table 4 shows, also, that in 1899, as compared with the average for the five years 1894-98, there was a large apparent increase in the number of deaths from consumption. This apparent increase may not be real, but due to a larger proportion of the actual deaths being reported since the new registration law became operative, as, in addition to the deaths reported directly to this office, others reported to the Secretary of State, of which we have not been notified by health officers, are received at this office from the bureau of Vital Statistics in the State Department.

Source of contagium of consumption.—Of the 2,975 reported cases of consumption during the year 1899, the local health officers reported the source of contagium as follows: Traced to a former case, 122; inherited, 154*; attributed to taking cold or exposure, 135; attributed to la grippe, or other diseases, 156; from infected clothing, 3; from outside of jurisdiction, 95; from poor food, 6; from infected house, 1; from dissipation, 13; from the asylum, 10; from tubercular cattle, 3; unknown, 679; source not stated, 1,598; total, 2,975.

How consumption is most commonly spread.—The tubercle bacillus, the specific cause of consumption, is found in a living state in the sputa from the lungs of persons suffering from that disease. The dust of dried tubercular sputum, when inhaled by susceptible persons, is thought to be the most common way of transmitting pulmonary consumption from person to person. The members of a family or household in which there is a consumptive person may be constantly exposed to the danger of infection, unless the sputa are carefully collected and destroyed. The object of much of the work done by the State Board of Health is to cause the prompt destruction of infected sputa before it is allowed to become dry, and to educate the people in this simple means of restricting the spread of consumption.

Ages of greatest prevalence of, and mortality from, consumption.—In Table 5 are shown the numbers of cases and deaths from consumption in Michigan in 1899, in which the ages were stated in the health officers' reports. In this table the cases and deaths are arranged in *age groups*, showing, by sex, what per cent the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; the per cent the deaths in each group were of the cases in that group, and the per cent the deaths in principal groups were of all deaths.

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*There is reason to believe that most of the reports which stated the disease to be "inherited" were made because of the belief of the reporters in the transmission of the disease in that manner, but that most such reports are made without sufficient proof to satisfy any scientific investigator.

From Table 6 it may be seen that there were 857 more deaths reported from consumption among females than among males (where age and sex were stated in the reports), during the years 1894-99.

Table 7 shows that the highest per cent of reported deaths, for each sex, occurred in the age period from 20 to 29 years. The average age at death during the five years 1894-98 was for males 37.0 and for females 32.3 years, or 4.7 years more for males than for females. In determining these averages, the deaths of 1,885 males and 2,429 females are considered.

TABLE 5.—*Exhibiting, by sex, in certain age-groups, the number of cases and the number of deaths from consumption in Michigan; the per cent that the cases in each group were of all cases; the per cent that the deaths in each group were of all deaths; and the per cent that the deaths in each group were of the cases in that group. (Compiled from all reports for the year 1899 which stated the ages.)*

	Number and per cent of cases and deaths in certain age-groups.																
Ages in groups of years.	Sex.	All known ages.	Under 10 years.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 to 64.	65 to 69.	70 to 74.	75 years and over.
No. of cases........	Males....	*1,156	31	17	79	179	148	127	107	97	90	71	51	47	57	26	29
	Females.	*1,526	45	31	169	255	263	194	145	110	75	48	48	56	32	26	29
Per cent the cases in each group were of all cases of known ages ...	Males....	100	2.7	1.5	6.8	15.5	12.8	11.0	9.3	8.4	7.8	6.1	4.4	4.1	4.9	2.2	2.5
	Females.	100	2.9	2.0	11.1	16.7	17.2	12.7	9.5	7.2	4.9	3.1	3.1	3.7	2.1	1.7	1.9
No. of deaths.....	Males....	1,030	29	9	73	161	131	109	93	84	80	65	46	43	54	25	28
	Females.	1,343	40	27	146	231	227	168	124	97	69	43	43	49	27	24	28
Per cent the deaths in each group were of cases in that group.........	Males....	......	94	53	92	90	89	86	87	87	89	92	90	92	95	96	97
	Females.	.. ...	89	87	86	91	86	87	86	88	92	90	90	88	84	92	97
Per cent the deaths in each group were of all deaths at known ages....	Males....	100	2.8	0.9	7.1	15.6	12.7	10.6	9.0	8.2	7.8	6.3	4.5	4.2	5.2	2.4	2.7
	Females.	100	3.0	2.0	10.9	17.2	16.9	12.5	9.2	7.2	5.1	3.2	3.2	3.6	2.0	1.8	2.1
Per cent the deaths in special groups were of all deaths at known ages....	Males....	......	3.7		35.4			27.8			33.1						
	Females.	......	4.0		45.0			29.0			21.1						

*Does not include those cases or deaths where the age was not stated.

TABLE 6.—*Exhibiting, by sex, the ages of 6,687 persons who died of consumption, during the years 1894-99. (Compiled from such reports to the State Board of Health, as stated sex and age.)*

Year.	1899.			1898.			Total 6 years, 1894-99.			Av. 6 years, 1894-99.	
Age at death.	Males.	Females.	Totals.	Males.	Females.	Totals.	Males.	Females.	Totals.	Males.	Females.
10 years and under	29	40	69	51	71	122	99	133	232	17	22
10 to 20 years	82	173	255	90	214	304	253	558	811	42	93
20 to 30 "	292	458	750	324	447	771	830	1,204	2,034	138	201
30 to 40 "	202	292	494	216	310	526	591	842	1,433	99	140
40 to 50 "	164	166	330	156	154	310	414	436	850	69	73
50 to 60 "	111	86	197	155	114	269	328	261	589	55	44
60 to 70 "	97	76	173	94	90	184	241	225	466	40	38
70 to 80 "	53	52	105	63	32	95	143	105	248	24	18
Over 80 "	0	0	0	13	8	21	16	8	24	3	1
	1,030	1,343	2,373	1,162	1,440	2,602	2,915	3,772	6,687	486	629

TABLE 7.—*Exhibiting, by sex, and in certain age-groups, the per cent of persons who died from consumption in Michigan, during the year 1899, and the average of the same for the years 1894-98; also the average age at death, and the number of deaths included. (Compiled from such reports as stated the ages.)*

Deaths from consumption.													
Year.	Sex.	Average age, years.	No. of deaths included.	Ages.—In periods of years. Per cent of deaths in each period of age.									
				All ages.	Under 10 years.	10 to 19.	20 to 29.	30 to 39.	40 to 49.	50 to 59.	60 to 69.	70 to 79.	Over 80 years.
1899.	Males	37.8	1,030	100	3	8	28	20	16	11	9	5	0
	Females	33.3	1,343	100	3	13	34	22	12	6	6	4	0
Average, 1894-98.	Males	37.0	1,885	100	4	9	29	21	13	12	8	5	1
	Females	32.3	2,429	100	4	16	31	23	11	7	6	2	.3

Duration of Consumption.—Fatal and non-fatal cases.—By Table 8, it may be seen that from reports received during the years 1894-98, which stated the interval between the time of being taken sick and the time of death from consumption, the largest per cent for both males and females occurred in the first year of sickness. The next highest per cent of deaths occurred in the second (1 to 2) year of sickness, and as the duration of sickness grew longer the per cent of deaths decreased. The average duration of fatal cases reported in the five years, 1894-8 was, for males 19.0 months and for females 26.1 months.

TABLE 8.—*Exhibiting, by sex of patient, the duration in months and years of fatal cases of sickness from consumption, in Michigan, during the year 1899, and the average for the 5 years 1894-98, arranged in time periods. (Compiled from those reports which stated the length of time the patient was sick.)*

Fatal cases of consumption.																			
Year.	Sex.	No. of cases included.	Duration of sickness:—Per cent of deaths in each period.																
			All cases.	1 Month.	2 Months.	3 Months.	4 Months.	5 Months.	6 Months.	7 Months.	8 Months.	9 Months.	10 Months.	11 Months.	Under one year.	1 to 2 yrs.	2 to 3 yrs.	3 to 4 yrs.	4 to 5 yrs.	Five years and over.
1899.	Males.......	725	100	6.6	4.0	4.1	5.5	4.6	7.3	5.2	4.0	4.4	2.8	2.9	51.4	21.1	13.1	5.0	2.8	6.6
	Females....	967	100	5.0	4.6	4.9	5.5	5.3	6.1	4.8	4.4	4.7	2.0	3.1	50.2	26.4	9.3	6.1	2.5	5.6
Av. 1894-98.	Males.......	225	100	6.2	4.4	4.4	4.4	5.8	7.6	3.6	4.0	3.1	3.6	2.2	49.8	26.7	11.6	4.4	2.2	5.3
	Females....	319	100	3.4	4.1	5.6	5.0	5.0	7.2	5.0	5.0	5.3	3.4	3.1	52.0	23.2	12.2	4.7	1.9	5.6

By Table 9 it may be seen that, from the reports of non-fatal cases of consumption during the five years 1894-98, the highest per cent were sick under one year, the next highest per cent were sick from one to two years, and as the duration grew longer the per cent of cases decreased. The average duration of sickness in non-fatal cases of consumption during the five years 1894-98 was, in males 18.1 and in females 13.4 months.

TABLE 9.—*Exhibiting, by sex of patient, the duration in months and years, of non-fatal cases (still sick) of consumption, in Michigan, in the year 1899 and average of the same for the years 1894-98, as stated in the reports to the State Board of Health.*

Non-fatal cases of consumption.																				
Year reported.	Sex.	No. of cases included.	Duration of sickness:—Per cent of cases in each period.																	
			All periods.	1 Month.	2 Months.	3 Months.	4 Months.	5 Months.	6 Months.	7 Months.	8 Months.	9 Months.	10 Months.	11 Months.	Under 1 yr.	1 to 2 yrs.	2 to 3 yrs.	3 to 4 yrs.	4 to 5 yrs.	5 to 9 yrs.	10 years and over.
1899.	Males.....	72	100	6.9	4.2	8.3	9.7	5.6	2.8	1.4	4.2	4.2	6.9	8.3	62.5	25.0	8.3	0	0	4.2	0
	Females..	96	100	3.1	6.3	5.2	4.2	4.2	7.3	3.1	3.1	7.3	3.1	3.1	50.0	28.1	11.5	3.1	2.1	3.1	2.1
Av. 1894-98.	Males.....	26	100	7.7	3.8	7.7	3.8	3.8	0.8	3.8	7.7	3.8	7.7	3.8	53.8	19.2	15.4	7.7	3.8	0.8	1.5
	Females..	34	100	5.9	5.9	5.9	2.9	2.9	5.9	2.9	5.9	8.8	2.9	5.9	58.8	23.5	5.9	5.9	0.6	2.9	0

Cases of consumption reported as having recovered.—In the reports relative to consumption received at this office during the years 1894-99, forty-nine cases were said to have recovered from the disease; eleven of these cases were reported in 1894, six in 1895, seven in 1896, nine in 1897, eight in 1898, and eight in 1899; they are tabulated below according to sex, age and duration:—

Sex.	Age.	Duration.	Sex.	Age.	Duration.
Males.....	14 years.	Not stated.	Females..	21 years.	2 years and 8 months.
	18 years.	7 months.		19 years.	5 months.
	27 years.	4 months.		35 years.	3 months.
	Not stated.	3 years and 10 months.		Not stated.	1 year.
	41 years.	Not stated.		37 years.	2 months.
	19 years.	7 months.		20 years.	Not stated.
	27 years.	8 months.		22 years.	Not stated.
	29 years.	1 year.		16 years.	Not stated.
	26 years.	4 months.		36 years.	9 months.
	34 years.	Not stated.		Not stated.	Not stated.
	26 years.	Not stated.		35 years.	3 months.
	35 years.	2 years.		20 years.	2 months.
	47 years.	3 months.		42 years.	8 months.
	35 years.	1 month.		30 years.	Not stated.
	42 years.	1 year.		31 years.	13 months.
	Not stated.	Not stated.		24 years.	6 months.
	Not stated.	Not stated.		Not stated.	Not stated.
	24 years.	16 months.		4 years.	14 months.
	35 years.	Not stated.		38 years.	36 months.
	35 years.	23 months.		Not stated.	5 months.
	21 years.	10 months.			
	Not stated.	Not stated.			
	Not stated.	39 months.			

The average age of the eighteen male cases, where the ages were stated, was 29.7 years; of the sixteen female cases, 26.9 years.

The average duration of sickness, where the time was stated, was for males, 14.4 months; for females, 10.7 months.

Location of the disease, reported in 3,681 instances.

Lungs	3,040
Lungs and bowels	83
Bowels	71
Lungs and throat	63
General	55
Chest	44
Throat	37
Stomach	22
Bronchi	20
Larynx	15
Lungs and bronchi	12
Liver	11
Lungs and stomach	11
Thorax	9
Lungs and larynx	9
Stomach and bowels	7
Lungs and abdomen	7
Lungs, bowels and kidney	6
Left side	5
Brain	5
Lungs and liver	5
Lungs and peritoneum	5
Glands and neck	5
Lungs and chest	5
Hip joint	5
Lungs, stomach and bowels	4
Head and lungs	4
Liver, stomach and bowels	4
Larynx and bronchi	3
Lungs and heart	3
Lungs and glands	3
Spine	3
Hip joint and lungs	3
Lungs and rectum	3
Miliary	2
Knee and lungs	2
Mesentery and lungs	2
Spine and lungs	2
Lungs and alimentary canal	2
Mesenteric gland	2
Lungs and bladder	2
Abscess in back	2
Leg	2
Face and lungs	2
Womb	2
Peritoneum	2
Lungs, kidney and bladder	2
Knee joint	2
Side	2
Respiratory organ	2
Heart	2
Lungs, abdomen and bladder	2
Bowels, lungs and larynx	2
Lungs and pleural cavity	2
Lungs and joints	2
Thorax and abdomen	2
Throat and chest	1
Stomach, bowels and brain	1
Lungs, lower maxilla bladder	1
Kidney	1
Inguinal	1
Ovaries	1
Spleen	1
Alimentary canal	1
Liver and bowels	1
Back and hips	1
Bowels and bronchi	1
Stomach and bronchi	1
Liver, lungs and spleen	1
Fibrous	1
Throat and kidneys	1
Hip, knee and lungs	1
Lungs and foot	1
Trachea	1
Neck	1
Lungs and neck	1
Bronchi and trachea	1
Viscera	1
Lungs, stomach and liver	1
Heart, lungs and liver	1
Lungs and thorax	1
Thigh, hip and kidney	1
Lungs, liver and kidney	1
Kidney, spleen and liver	1
Glands and bowels	1
Lungs, peritoneum and brain	1
Heart and kidney	1
Stomach and bladder	1
Arm, hand and brain	1
Kidney and bladder	1
Mastoid abscess	1
Stomach and throat	1
Throat and larynx	1
Chest and abdomen	1
Lungs and spine	1
Shoulder joint	1
Throat and tongue	1
Breast	1
Back thigh	1
Throat and trachea	1
Lungs and brain	1
Bowels and meninges	1
Throat and bronchi	1
Pelvis	1
Lungs, abdomen and stomach	1
Bowels and rectum	1

Consumptive relatives, reported in 1,361 instances.

Sister	236
Mother	192
Brother	132
Father	106
Aunt	63
Daughter	55
Brother and sister	54
Grandparents	41
Wife	37
Mother and sister	37
Husband	36
Cousin	34
Uncle	32
Father and sister	27
Father and mother	24
Father and brother	19
Son	15
Mother and brother	14
Niece	11
Mother, sister and brother	10
Father, mother and sister	8
Uncles and aunt	7
Wife and daughter	5
Brother-in-law	5
Aunt and grandmother	5
Father and cousin	4
Two sons and daughter	4
Sister and husband	4
Father, brother and sister	4
Mother and two sisters	4
Second cousin	4
Half-sister	3
Nephew	3
Sister and daughter	3
Daughter and son	3
Husband and daughter	2
Half-brother	2
Mother and aunt	2
Grandmother, aunt and cousin	2
Two brothers and daughter	2
Great aunt	2
Brother and four sisters	2
Two half-sisters	2
Father, mother and brother	2
Daughter and son-in-law	2
Father, mother, sister and brother	2
Cousin and aunt	2
Father and uncle	2
Grandmother and uncle	2
Mother-in-law	2
Great-grandmother	2
Aunt and sister	2
Two aunts	2
Two brothers	2
Aunt and grandfather	2
Father, wife and brother	1
Father's family	1
Mother and two brothers	1
Son, daughter and grandchild	1
Mother, two brothers, five sisters, grandmother and great-grandmother	1
Mother and uncle	1
Mother, grandfather and uncles	1
Mother, brothers and sister	1
Grandchild	1
Second wife, stepfather and sister	1
Father, mother, grandfather and two aunts	1
Wife, sons and daughter	1
Grandparents, four sisters and brother	1
Grandmother, aunt and father	1
Grandmother and two sisters	1
Ancestors	1
Mother and grandfather	1
Brother and husband	1
Parents and aunt	1
Great-grandmother, uncle and aunt	1
Mother and son	1
Mother and wife	1
Granddaughter	1
Sister and niece	1
Mother and cousin	1
Brother and cousin	1
Sister, uncle, mother and aunts	1
Grandfather and father	1
Grandmother and father	1
Three sisters and father	1
Husband and son	1
Grandfather, sister and aunt	1
Great aunt and uncle	1
Sister and cousin	1
Two brothers, seven nieces and nephews	1
Father and aunt	1
Brother, sister, uncles and father	1
Four children	1
Parents, four sisters and two brothers	1
Husband, daughter and sister-in-law	1
Son-in-law and grandchild	1
Fourteen children	1
Cousin and uncle	1
Mother, father and husband	1
Uncle and two cousins	1
Brother and wife	1
Sister-in-law	1
Mother, grandmother and two sisters	1
Wife and son	1
Sister, cousin and wife	1
Father, three sisters and brother	1

Consumptive relatives, reported in 1,361 instances.—Continued.

Cousin, aunt, father and sister	1
Husband and sister	1
Mother, brother and half-brother	1
Twin brother	1
Father and wife	1
Grandmother and wife	1
Daughter, mother and uncle	1
Two children of a sister	1
Stepfather	1
Cousin and nephew	1
Wife, mother and cousin	1
Mother, sister and father	1
Mother, two sisters and two aunts	1
Father, aunt and sister	1
Stepdaughter	1
Sister, uncle and grandfather	1
Grandparents and their family	1
Mother, brother and one sister	1
Husband and stepdaughter	1
Brother and mother-in-law	1
Father-in-law	1
Son-in-law	1
Grandfather, mother, brothers and sisters	1
Mother and grandmother	1
Mother, grandmother and aunt	1
All the family	1
Grandfather, three aunts and an uncle	1
Grandfather and aunts	1
Father, stepfather and sister	1

Consumptive associates were reported in 471 instances, as follows:

Sister	76
Mother	58
Brother	50
Father	32
Daughters	24
Wife	23
Husband	24
Brother and sister	20
Mother and sister	15
Mother and father	10
Father and sister	10
Friend	8
Father and brother	8
Cousin	8
Son	7
Aunt	7
Brother and mother	6
Grandmother	5
Brother-in-law	5
Neighbor	5
Wife and daughter	4
Father, mother and sister	4
Niece	4
Mother, brother and sister	3
Sister-in-law	3
Father, brother and sister	3
Family	2
Wife and sister	2
Aunt and mother	2
Uncle	2
Mother-in-law	2
Father and grandmother	2
Half-sister	2
Son and daughter	2
Grandfather	2
Parents and aunt	1
Mother and wife	1
Stepmother	1
Brother and husband	1
Brother and two nieces	1
Sister and husband	1
Mother and cousin	1
Brother and cousin	1
Husband and daughter-in-law	1
Sister and daughter	1
Patients	1
Sister, cousin and wife	1
Grandmother and uncle	1
Two sons and daughter	1
Father, mother, sister and brother	1
Second cousin	1
Two brothers and daughter	1
Relative by marriage	1
Father and grandfather	1
Sister, uncle, mother and aunt	1
Aunt and sister	1
Mother, sister, wife and children	1
Father, mother and cousin	1
Ladies in hospital	1
Schoolmate	1
Father and wife	1
Mother and two brothers	1
Husband and two daughters	1
Daughter, mother and uncle	1
Son-in-law	1
Brother's wife	1

Occupation of consumptives, reported in 3,802 instances.

Housewife	1,007	Minister	6	Actor	2
Farmer	632	Doctor	5	Manufacturer	2
Laborer	414	Nurse	5	Commissioner	2
Housework	311	Baker	5	Designer	1
Housekeeping	284	Hotelkeeper	5	Dealer in wool and hides	1
Student	191	Boomman	5	Saw filer	1
Clerk	82	Fisherman	5	Hackman	1
School teacher	79	Lumber dealer	5	Dentist	1
Milliner and dressmaker	55	Cooper	5	Fruit packer	1
Farmer's wife	51	Moulder	4	Balloonist	1
Carpenter	42	Stenographer	4	Dealer in stock	1
Merchant	34	Soldier	4	Bicycle rider	1
Accountant	31	Seaman	4	Smelter	1
Painter	30	Jeweler	4	Surgeon	1
Miner	29	Buttermaker	3	Errand boy	1
Railroad employe	28	Laundress	3	Turner	1
Saloonkeeper	26	Miller	3	Brass worker	1
Machinist	24	Watchman	3	Contractor	1
Blacksmith	22	Janitor	3	Compositor	1
Printer	19	Gardener	3	Bootblack	1
Cigarmaker	18	Sister of mercy	3	Telephone manager	1
Teamster	17	Marble cutter	3	Butler	1
Mason	16	Gambler	2	Saddler	1
Telegraphist	16	Artist	2	Street car conductor	1
Cook	15	Drayman	2	Bricklayer	1
Barber	15	Candymaker	2	Polisher	1
Factory hand	13	Lumber scaler	2	Fireman	1
Tailor	12	Brewer	2	Bank teller	1
Shoemaker	12	Pensioner	2	Tramp	1
Engineer	12	Millwright	2	Decorator	1
Woodman	11	Hairdresser	2	Laborer's wife	1
Commercial traveler	10	Foreman	2	Plumber	1
Farmer's daughter	10	Lawyer	2	Typewriter	1
Grocer	9	Weaver	2	Surveyor	1
Millhand	9	Sailor	2	Lithographer	1
Furniture dealer	9	Boilermaker	2	Professor	1
Butcher	8	Brickmaker	2	Showman	1
Druggist	8	Hunter	2	Drover	1
Agent	7	Waiter	2	Shiptender	1
Horse dealer	7	Mechanic	2	Cutter	1
Photographer	6	Upholsterer	2		

The method of disinfection of sputa and soiled articles was mentioned in 2,040 instances, as follows:

Burned	1,223
Sulphur fumes	136
Carbolic acid	121
Burned and boiled	85
Boiled	71
Chloride of lime	44
Buried	41
Burned and sulphur fumes	34
Formaldehyde	29
Bichloride of mercury	20
Ashes	18
Boiled and fumigated	14
Chloride solution	12
Platt's solution	11
Bichloride of mercury and fire	10
Sulphur and boiling	9
Copperas	9
Boiled, burned and formaldehyde	8
Disinfected	8
Burned, boiled or fumigated	7
Burned and carbolic acid	7
Zinc	7
Carbolic acid and sulphur fumes	6
Heating and sulphur fumes	6
Burned and buried	5
Boiling and zinc	5
Burned and formaldehyde	5
Chloride and sulphur	5
Carbolic acid and boiling	5
Washing	5
Boiled and bichloride solution	4
Burned, carbolic acid and sulphur	4
Steam and fire	4
Carbolic acid and lime	4
Carbolic acid, turpentine and sulphur	3
Burned and lime	3
Steamed	3
Sulphur and zinc	3
Burned and zinc solution	3
Buried and boiled	3
Ashes and lime	3
Boiled, burned and chloride of lime	2
Chloride solution, sulphur and boiling	2
Steam and carbolic acid	2
Bichloride of mercury and carbolic acid	2
Lime and burning	2
Washing and sulphur fumes	2
Disinfectant solution	2
Sulphur, scrubbing and whitewashing	1
Chloride of lime and buried	1
Vapo-cresoline and buried	1
Chloride of lime, mercury, chloride solution and boiled	1
Zinc, boiling and sulphur	1
Fire, boiling and sulphur	1
Carbolic acid and Platt's solution	1
Fire and copperas	1
Ashes and burned	1
Steam and chloride of lime	1
Steam and formaldehyde	1
Chloride of mercury and formaldehyde	1
Zinc and salt	1
Zinc, sulphur and salt	1
Bichloride and buried	1
Lime and boiling	1
Potash	1
Sulphur and formaldehyde	1
Lime and zinc	1
Sulphate of iron and burned	1
Burning and mercury	1
Creolin and boiling water	1
Antiseptic paper burned	1

Bowel discharges were disposed of in 2,522 instances, as follows:

Buried	636	Scalded or boiled	16	Bichloride and lime	3
Vault	559	Vault and lime	14	Vault and copperas	3
Privy	286	Bichloride and mercury	11	Sulphate of iron	2
Sewer	176	Privy and lime	11	Destroyed	2
Disinfected	147	Privy and ashes	9	Disinfected and sewer	2
Burned	123	Platt's solution	9	Calcium chloride	2
Closet	113	Carried away	8	Copperas and buried	2
Ground	108	Copperas	8	Bichloride of mercury and lime	2
Disinfection and buried	57	Buried and lime	8	Lime and sulphur	1
Carbolic acid	42	Bichloride and privy	6	Formalin	1
Lime	35	Disinfected and buried	5	Thrown in creek	1
Chloride	31	Lime and ashes	4	Vault and sulphur	1
Disinfection and privy	29	Carbolic acid and vault	4	Mercury and sewer	1
Ashes	20	Zinc solution	3	Carbolic acid	1
Chloride of lime and buried	17	Cesspool	3		

Disease was stated to have begun in 2,624 instances with—

Cold	1,234	Laryngitis	4	Abscess	2
Influenza or la grippe	414	Diarrhea	4	In toe	1
Bronchitis	309	Scrofula	3	Change of life	1
Hemorrhage	187	Inflammation of kidney	3	Catarrhal fever	1
Pneumonia	181	Cold and dyspepsia	3	Curvature of spine	1
Cough	54	Marasmus	3	Mesenteric glands	1
General debility	28	Throat	3	Shoulder joint	1
Typhoid fever	27	Anemia	2	Softening of brain	1
Pleurisy	23	Suppressing menses	2	Stomach	1
Measles	21	After miscarriage	2	Gastric fever	1
Catarrh	14	Tubercular glands	2	Appendicitis	1
Asthma	11	Chills and fever	2	Headache and night sweats	1
Bowel trouble	11	Fistula	2	Cholera infantum	1
Malarial fever	11	Heart	2	Quinsy	1
Child birth	10	Sciatica and rheumatism	2	Ulceration of rectum	1
Ill from birth	6	Enlarged glands	2	Hip disease	1
Whooping-cough	6	Extreme nervousness	2	Brain fever	1
Congestion of lungs	6	Lumbago	2	Scarlet fever	1
Pain in side	5	Congestion of liver	2		

Nationalities of consumptives, reported in 3,925 instances.

American	2,328	Finnish	47	Russian	5
German	505	Polish	35	Swiss	3
Canadian	223	Norwegian	18	Welsh	3
Irish	190	Nova Scotian	10	Italian	3
Dutch	135	Danish	13	Scandinavian	3
English	132	Caucasian	12	Assyrian	2
French	110	Austrian	7	Australian	1
Swedish	77	Belgian	7	Greek	1
Scotch	49	Bohemian	5	Hungarian	1

Information contained in final reports of cases of consumption during the years 1895-99.—For the year 1895, 42 final reports of fatal cases of consumption in Michigan, were received at this office; for 1896 there were 137, for 1897 there were 457, for 1898, 1,872 and for 1899, 1,920 such final reports received relative to fatal cases of consumption. The information contained in these 4,428 reports, for the five years, is combined and summarized below.

Of the 6,304 consumptives of whom the sex was stated, 2,769 were males and 3,535 were females.

Of 5,964 consumptives of whom the color was stated, 5,800 were white, 107 black (negroes) and 57 red (indians).

The complexion of 2,913 consumptives was stated as: Black 17, dark 919, light 1,977.

Color of hair was stated in 3,018 instances as: Black 183, dark 1,336, brown 318, auburn 356, light 776, white or gray 49.

Of the civil condition of 4,234 consumptives 2,455 were reported as married, 1,656 single, and 123 as widows or widowers.

Of 2,854 replies given in the reports to the question, were sputa of consumptives bacteriologically examined, 2,124 were "no" and 730 "yes."

To the question, were discharges from the bowels of consumptives bacteriologically examined, there were 1,359 answers, all in the negative.

In answer to the question, were persons or animals infected from this patient, in 56 instances the reply was "yes." In 1898 twenty-seven persons and three animals, and in 1899 fifteen persons and three animals were reported to have taken the disease from consumptives.

Results of bacteriological examinations of sputa of alleged consumptives in Michigan, in 1898 and 1899.—As previously stated in this article 730 affirmative replies were given to the question, "Was the sputum of the patient bacteriologically examined for the bacillus tuberculosis?" Relative to the results of these examinations only 311 positive statements were made. In 290 instances bacilli tuberculosis were reported to have been found in the sputa. In twenty-one instances the result was reported negative, no bacilli having been found; thus showing that the results in about 93 per cent of the examinations were positive and in only about 7 per cent were negative.

Supposed infection from milk.—Relative to a case of consumption in Madison Township, Lenawee County, the health officer stated the source of contagium:

"From infection from milk of some cow, while handling the milk; infection took place from slight scratch."

Consumption probably spread by insufficient disinfection.—Of the source of contagium of a case of consumption in Morton Township, Mecosta County, the health officer wrote:

"Infection from rooms. Four have died with the disease in same family and house."

The health officer of Delaware Township, Sanilac County, reporting relative to a case of consumption said:

"I think it had its origin in the house where deceased lived after her marriage."

Relative to a death from consumption, in Marlette Village, the health officer wrote:

"Patient lived in family with three that died. Sister, brother and mother died within ten years."

Infection believed to have been by direct contact.—Relative to a decedent from consumption in Minden Township, Sanilac County, the health officer wrote, that the patient lived in the house with a consumptive daughter and "Nursed a brother-in-law who died of it."

Suspected infection from cow's milk.—The Detroit News of February 1, 1899, contained the following news item:

"Ann Arbor, Mich., January 31. (Special.)—Prof. Arthur Crozier, who died here Sunday, was the victim of acquired tuberculosis. About two years ago Crozier roomed at the Agricultural College, near the spot where a herd of cattle afflicted with tuberculosis were killed, and in this manner he is thought to have contracted the disease."

Relative to this case the health officer of Ann Arbor Township reported to this office as follows:

"Tuberculosis in the cattle at the State Experiment Station, Lansing, was discovered in them the time it was in him. Office was near the barn-yard and patient was among the cattle and drank of this milk which was pronounced free from infection."

Inquiry of the superintendent of the Experiment Station at the Agricultural College brought the reply that it was not probable that Prof. Crozier contracted the tuberculosis from the milk or from the infected animals at the college.

Relative to the source of contagium in a decedent from consumption in Greenfield Township, Wayne County, the health officer reported:

"Inhalation of desiccated tuberculous sputum."

PNEUMONIA IN MICHIGAN IN 1899.

During the year 1899 there were reported to the office of the State Board of Health, fourteen cases of pneumonia with five deaths, from seven localities in Michigan, as follows: Kalamazoo City one case, one death; Waterloo Township, Jackson County, one case, one death; Watertown Township, Tuscola County, one case; McBain Village, Missaukee County, five cases, one death; Sodus Township, Berrien County, one case; Bark River Township, Delta County, one case, one death; Lakeview Village, Montcalm County, four cases, one death.

The above-mentioned are all the individual cases of pneumonia which were reported to this office during the year; but they do not constitute the whole amount of sickness from this disease in the State during this period. Reference to Exhibit I, page 63, of the article on "Sickness Statistics" in this report shows that, of the 5,126 weekly card reports received at this office during the year, 17 per cent stated the presence of pneumonia in the State. The Vital Statistics Bulletins, compiled in the State Department, indicate that in 1899 pneumonia caused more deaths in Michigan than consumption or any other disease, except organic heart disease. However, the final compilation shows that the deaths from consumption and tuberculosis without epithet were 2,354, and the deaths from pneumonia were 2,192.

Is pneumonia a communicable disease?—Relative to pneumonia in Lakeview Village, the local health officer wrote to the Secretary of this Board as follows:

> "Is pneumonia a communicable disease? Why I ask I have had four cases all in the same family. February 21 I was called to see a sick girl 14 years old and found a well developed case of croupous pneumonia. On March 1 I found the second case, a young lady aged 17. Both of these cases progressed finely. On the 8th of March I found the third case, a man aged 78. This case proved fatal in 90 hours. The last case was taken March 16 and at this date is doing well and will recover. In all these cases the inflammation invaded the lower lobes of the right lung and ran a normal course."

In reply to the health officer's letter, March 27, the secretary wrote:

> "Pneumonia is a dangerous communicable disease. With this mail I send you pamphlets 228, 226 (page 2 marked) Teachers' Sanitary Bulletin No. 9, relative to disinfection by formaldehyde, and three copies of plates relative to germs (marked) to indicate the germ which is believed to cause most cases of pnuemonia.

MENINGITIS IN MICHIGAN IN 1899.

Although many years ago, before the specific germ of epidemic meningitis had been discovered, this subject was investigated by Secretary Baker of this Board, in connection with an epidemic of meningitis which occurred in this State in 1873-74; and all known facts relative to said epidemic and the then prevailing theories as to the origin, nature and causes of the disease were discussed, it was not till December, 1895,* that this Board decided to add meningitis to the list of communicable diseases dangerous to the public health; and not until 1899, when a serious epidemic of meningitis began, that this Board commenced active measures for the study and for the prevention and restriction of the disease.

This article, which is the first of its kind to appear in an annual report of this Board, gives the data obtained from a compilation of the reports to this office relative to meningitis in Michigan during the year 1899.

As shown in the following table (1), meningitis was reported to have been present in 544 localities in Michigan in 1899. In these localities 1,306 cases of sickness from meningitis were reported to have occurred, of which 1,079 were fatal; thus indicating that, as a rule, only fatal cases were reported; there being an average of 2.40 cases of sickness and 1.98 deaths per locality, and a general fatality from meningitis in the State of 82.62 deaths per one hundred cases reported.

TABLE 1.—*Cerebro-spinal meningitis, meningitis, spinal meningitis, and tubercular meningitis in Michigan. The number of reported localities, cases and deaths, the average number of cases and deaths per locality, and the per cent of cases which proved fatal, in 1899; also the total number of cases and of deaths from meningitis other than those reported as tubercular meningitis.*

Year 1899.	Reported localities.	Reported cases.	Average cases per locality.	Reported deaths.	Average deaths per locality.	Deaths per 100 cases reported.
Cerebro-spinal meningitis.....	313	901	2.88	699	2.23	77.58
Meningitis.....................	137	250	1.82	245	1.79	98.00
Spinal meningitis.............	67	113	1.69	94	1.40	83.18
Tubercular meningitis........	27	42	1.55	41	1.52	97.62
Total meningitis.............	544	1,306	2.40	1,079	1.98	82.62
Total meningitis other than tubercular.................	517	1,264	2.44	1,038	2.01	82.12

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* By leaflet No. 228.

Meningitis was reported to, and has been compiled in this office under four different titles. Table 1 shows that those cases and deaths reported as cerebro-spinal meningitis were much more numerous than those reported under any of the other titles; and that the cases and deaths reported as from tubercular meningitis were much less than those reported under any other head, and practically only the fatal cases of that form of meningitis were reported.

A noticeable and somewhat perplexing feature of the reports made to this office in 1899, relative to meningitis, is the use, by reporters, of different terms to designate the same disease, and not infrequently the same case. Cases in the same locality, same outbreak, having the same symptoms, have been variously called cerebro-spinal meningitis, cerebral meningitis, spinal meningitis, or meningitis. It has sometimes occurred that the same physician, in his reports to this office, has called the same case "meningitis," "spinal meningitis" and "cerebro-spinal meningitis." It thus appears that while in some instances a distinction based on certain characteristics of the disease, is made, it more frequently occurs that the various above-mentioned terms are used indiscriminately in designating any form of the disease, except sometimes the tubercular, and the traumatic.

TABLE 2.—*Exhibiting the reported number of deaths from meningitis and from tubercular meningitis per 100,000 persons living in Michigan in each of the thirty years 1869-96, 1898 and 1899.* Compiled from the Secretary of State's Vital Statistics of Michigan. (Population for intercensal years estimated by average annual increase, based on national and State censuses.)*

Year.	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883
Meningitis	.11	.09	.20	2.82	6.15	1.36	1.18	.84	.92	.71	.65	.97	1.97	1.31	1.29
Tubercular meningitis	.10	.55	.53	.66	.61	.43	.43	.47	.40	.36	.27	.26	.38	.28	.27
Year.	**1884**	**1885**	**1886**	**1887**	**1888**	**1889**	**1890**	**1891**	**1892**	**1893**	**1894**	**1895**	**1896**	**1898**	**1899**
Meningitis†	1.31	.93	.95	.94	.97	.80	.86	.95	.68	.78	.81	.78	.83	2.81	4.27
Tubercular meningitis	.27	.18	.21	.32	.23	.21	.20	.13	.15	.17	.18	.13	.14	.50	.59

* Table two does not show the number of reported deaths from meningitis and tubercular meningitis for the year 1897, because the reports to the Secretary of State for that year have not yet been compiled.

† The title meningitis includes spinal meningitis, cerebro-spinal meningitis, spotted fever, etc.; but not that reported as tubercular.

The vital statistics collected and compiled in the Secretary of State's Department under the new registration law which went into operation in the latter part of 1897, probably represent nearly all deaths which have occurred in the State since that year; whereas the numbers of reported deaths in the years prior to 1897 should probably be largely increased to equal the actual number of deaths which occurred in those years; therefore, without due allowance for this fact, the statistics for years preceding, are not comparable with those succeeding, 1897.

From Table 2 it would appear that during the years specified therein, there occurred two epidemic periods, in which there was marked increase in the mortality from this disease. The first began in 1872 and reached its maximum intensity in 1873; the other began in 1898 and increased in intensity through 1899. This latter epidemic was not nearly so severe as the former, for whereas the death-rate in the former epidemic was 6.15 per 100,000 of population (compiled from reports made under the old registration law); the highest death-rate in the latter epidemic reached only 4.27 per 100,000 of population (compiled from reports made under the new registration law).

Routes by which meningitis enters the body.

Just how meningitis has been spread, has not been plain. The secretary of this Board has heretofore pointed out the fact that the mortality statistics of the State Department for the 10 years, 1887-96 (in which period no epidemic year for meningitis is included), show that, in Michigan, meningitis of all forms, except tubercular meningitis, culminates in August, *following the hot weather and the abdominal diseases* incident to the hot weather. The same is also true relative to tubercular meningitis, providing the year 1888 is left out, in which year the maximum was reached in May, which was probably due to a cold January and the consequent fact that the deaths from consumption in 1888 were nearly 300 more than the yearly average for the 10 years; in other words, 1888 was an epidemic year for consumption. No epidemic year for meningitis not tubercular is included in the above-mentioned 10 years; but from other statistics it seems to be a general truth that *epidemic* meningitis is most prevalent following the cold weather and the diseases of the lungs and air-passages incident to the cold weather; therefore, the specific causes of *epidemic* meningitis, including epidemic tubercular meningitis, probably enter the body by way of the air-passages; also, it is plain, from the statistics, that all *other* meningitis than epidemic is most prevalent following the warm weather and the consequent bowel diseases, therefore it is apparent that its specific causes most frequently enter the body by way of the alimentary canal.

It is hoped that these facts, already proved by statistics, may make the subject of the causation of meningitis, and of its relations to other diseases, much plainer than heretofore.

It should be understood and remembered that meningitis is caused not only by the bacillus tuberculosis, but by various other specific causes of diseases, which find their way through the blood or lymph channels to the membranes covering the brain and spinal cord, and there cause inflammation.

Distribution of meningitis throughout the State.—Table 3 shows the amount of reported sickness and deaths in each county of the State during the year 1899, from meningitis. The county having the greatest number of reported cases of sickness and of deaths was Houghton, where 205 cases, of which 157 died, were reported to have occurred. The least number of reported cases and deaths, where sickness occurred, were in Luce, Ogemaw, Otsego and Presque Isle counties, from each of which there was reported one fatal case.

Sickness and death-rates from meningitis.—Table 3 shows by counties the distribution of reported cases of sickness and deaths from this disease; it shows also the deaths per 10,000 population for each county and for the State. From these death-rates a better understanding of the comparative amount of sickness and death from the disease in each county may be obtained.

It appears from Table 3 that the highest death-rate (63.73) was in Alger county, and the lowest, in which any death occurred (.93), was in Cass county. No death was reported as having occurred in either of the counties of Alcona, Crawford, Gladwin, Montmorency, Oscoda, and Roscommon.

TABLE 3.—*Numbers of cases and deaths reported from cerebro-spinal meningitis, meningitis, spinal meningitis, tubercular meningitis, and the total cases and deaths from meningitis per 10,000 persons living in the State and in each county in Michigan during the year 1899. (Compiled from the reports of health officers. Includes, also, deaths reported to the State Department.) In many other instances only the fatal cases were reported.*

Counties.	Estimated population in 1899.*	Cerebro-spinal meningitis.				Meningitis.				Spinal meningitis.				Tubercular meningitis.				Total meningitis.			
		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
STATE	2,426 331	901	699	3.71	2.88	250	245	1.03	1 01	113	94	.47	.39	42	41	.17	.17	1,306	1,079	5.38	4.45
Alcona	5,429	0	0	0	0	......	......	......	......	......	......	......	......	......	......	......	......	0	......	0	0
Alger	1,569	3	3	19.12	19.12	7	7	44.6	44.6	......	......	......	......	......	......	......	......	10	10	63.73	63.73
Allegan	39,474	22	17	5.57	4.31	......	......	......	......	2	2	.51	.51	1	1	.25	.25	25	20	6.33	5.07
Alpena	20,387	4	4	1.96	1.96	......	......	......	......	......	......	......	......	......	......	......	......	4	4	1.96	1.96
Antrim	14,946	17	12	11.37	8.03	......	......	......	......	......	......	......	......	......	......	......	......	17	12	11.37	8.03
Arenac	8,518	3	3	3.52	3.52	......	......	......	......	1	1	1.17	1.17	......	......	......	......	4	4	4.70	4.70
Baraga	5,727	8	8	13.97	13.97	......	......	......	......	......	......	......	......	......	......	......	......	8	8	13.97	13.97
Barry	23,594	14	10	5.93	4.24	2	2	.85	.85	1	1	.42	.42	......	......	......	......	17	13	7.20	5.51
Bay	67,419	12	12	1.78	1.78	8	8	1.19	1.19	1	1	.15	.15	......	......	......	......	21	21	3.11	3.11
Benzie	11,596	29	16	25.01	13.80	......	......	......	......	1	1	.86	.86	......	......	......	......	30	17	25.87	14.66
Berrien	51,073	6	4	1.17	.78	2	2	.39	.39	1	1	.20	.20	......	......	......	......	9	7	1.76	1.37
Branch	25,477	3	3	1.18	1.18	......	......	......	......	......	......	......	......	......	......	......	......	3	3	1.18	1.18
Calhoun	52,436	11	10	2.10	1.91	3	3	.57	.57	3	3	.57	.57	......	......	......	......	17	16	3.24	3.05
Cass	21,455	1	1	.47	.47	1	1	.47	.47	......	......	......	......	......	......	......	......	2	2	.93	.93
Charlevoix	12,637	2	2	1.58	1.58	......	......	......	......	......	......	......	......	......	......	......	......	2	2	1.58	1.58
Cheboygan	16,293	8	3	4.91	1.84	3	3	1.84	1.84	......	......	......	......	1	1	.61	.61	12	7	7.37	4.30
Chippewa	19,451	1	1	.51	.51	1	1	.51	.51	1	1	.51	.51	......	......	......	......	3	3	1.54	1.54
Clare	8,499	3	1	3.53	1.18	3	3	3.53	3.53	1	1	1.18	1.18	......	......	......	......	7	5	8.24	5.88
Clinton	25,953	1	1	.39	.39	3	3	1.16	1.16	......	......	......	......	3	3	1.16	1.16	7	7	2.70	2.70
Crawford	2,395	0	0	0	0	......	......	......	......	......	......	......	......	......	......	......	......	0	0	0	0
Delta	24,177	7	7	2.90	2.90	1	1	.41	.41	......	......	......	......	......	......	......	......	8	8	3.31	3.31
Dickinson	15,635	2	2	1.29	1.29	1	1	.64	.64	1	1	.64	.64	......	......	......	......	4	4	2.56	2.56
Eaton	33,273	4	4	1.20	1.20	2	2	.60	.60	1	1	.30	.30	2	2	.60	.60	9	9	2.70	2.70
Emmet	13,045	4	3	3.07	2.30	1	1	.77	.77	2	2	1.53	1.53	......	......	......	......	7	6	5.37	4.60
Genesee	41,957	7	7	1.67	1.67	2	2	.48	.48	2	2	.48	.48	......	......	......	......	11	11	2.62	2.62
Gladwin	5,765	0	0	0	0	......	......	......	......	......	......	......	......	......	......	......	......	0	0	0	0
Gogebic	15,229	2	1	1.31	.66	1	1	.66	.66	......	......	......	......	......	......	......	......	3	2	1.97	1.31

Grand Traverse	22,715	10	3	4.40	1.32	1	1	.44	.44	......	......	......	......	......	......	......	......	11	4	4.84	1.76
Gratiot	28,911	11	11	3.80	3 80	2	2	69	.69	......	......	......	......	1	1	.35	.35	14	14	4.84	4.84
Hillsdale	29,787	3	3	1.01	1.01	8	7	2.69	2.35	1	1	.34	.34	......	......	......	......	12	11	4.03	3.69
Houghton	55,124	172	126	31.20	22.86	24	24	4.35	4.35	7	5	1.27	.91	2	2	.36	.36	205	157	37.19	28.48
Huron	36,895	7	6	1.90	1.63	1	1	.27	.27	......	......	......	......	2	2	.54	.54	10	9	2.71	2.44
Ingham	42,218	6	5	1.42	1.18	......	......	......	......	......	......	......	......	......	......	......	......	6	5	1.42	1.18
Ionia	37,344	20	13	5.36	3.48	......	......	......	......	5	5	1.34	1.34	......	......	......	......	25	18	6.69	4.82
Iosco	8,735	1	1	1.14	1.14	1	1	1 14	1.14	2	2	2.29	2.29	......	......	......	......	4	4	4.58	4.58
Iron	5,628	0	0	0	0	2	2	3.55	3.55	......	......	......	......	......	......	......	......	2	2	3.55	3.55
Isabella	24,758	24	19	9.69	7.67	2	2	.81	.81	......	......	......	......	......	......	......	......	26	21	10.50	8.48
Jackson	48,415	10	10	2.07	2.07	4	4	.83	.83	1	1	.21	.21	......	......	......	......	15	15	3.10	3.10
Kalamazoo	45,535	7	7	1.54	1.54	7	7	1.54	1.54	2	2	.44	.44	......	......	......	......	16	16	3.51	3.51
Kalkaska	6,240	2	1	3.21	1.60	1	1	1.60	1.60	1	1	1.60	1.60	......	......	......	......	4	3	6.41	4.81
Kent	136,958	82	54	5.99	3.94	24	23	1.75	1 68	34	20	2.48	1.46	3	3	.22	.22	143	100	10.44	7.30
Keweenaw	2,829	4	4	14.14	14.14	......	......	......	......	......	......	......	......	1	1	3.53	3.53	5	5	17.67	17.67
Lake	5,137	2	2	3.89	3.89	......	......	......	......	1	1	1.95	1.95	......	......	......	......	3	3	5.84	5.84
Lapeer	28,460	2	2	.70	.70	2	2	.70	.70	2	1	.70	.35	1	1	.35	.35	7	6	2.46	2.11
Leelanau	11.310	5	5	4.42	4.42	1	1	.88	.88	......	......	......	......	1	1	.88	.88	7	7	6.19	6.19
Lenawee	48,657	3	3	.62	.62	5	5	1.03	1.03	1	1	.21	.21	......	......	......	......	9	9	1.85	1.85
Livingston	19,911	1	1	.50	.50	1	1	.50	.50	......	......	......	......	1	0	.50	0	3	2	1.51	1.00
Luce	2,214	1	1	4.52	4.52	......	......	......	......	......	......	......	......	......	......	......	......	1	1	4.52	4.52
Mackinac	6,496	1	1	1.54	1.54	1	1	1.54	1.54	......	......	......	......	1	1	1.54	1.54	3	3	4.62	4.62
Macomb	34,105	4	4	1.17	1.17	8	8	2.34	2.34	......	......	......	......	......	......	......	......	12	12	3.52	3.52
Manistee	28,469	55	30	19.32	10.54	......	......	......	......	2	2	.70	.70	......	......	......	......	57	32	20.02	11.24
Marquette	40,418	20	17	4.95	4.21	4	4	.99	.99	......	......	......	......	1	1	.25	.25	25	22	6.19	5.44
Mason	20,968	4	4	1.91	1.91	1	1	.48	.48	1	1	.48	.48	1	1	.48	.48	7	7	3.34	3.34
Mecosta	22,019	10	9	4.54	4.09	3	3	1.36	1.36	1	1	.45	.45	1	1	.45	.45	15	14	6.81	6.36
Menominee	25,248	1	1	.40	.40	9	9	3.56	3.56	......	......	......	......	2	2	.79	.79	12	12	4.75	4.75
Midland	16,419	1	1	.61	.61	2	2	1.22	1.22	......	......	......	......	1	1	.61	.61	4	4	2.44	2.44
Missaukee	9,339	5	5	5.35	5.35	......	......	......	......	......	......	......	......	......	......	......	......	5	5	5.35	5.35
Monroe	34 236	7	7	2.04	2.04	3	3	.88	.88	......	......	......	......	......	......	......	......	10	10	2.92	2.92
Montcalm	36,059	22	17	6.10	4.71	3	3	.83	.83	2	2	.55	.55	......	......	......	......	27	22	7.49	6.10
Montmorency	3,627	0	0	0	0	......	......	......	......	......	......	......	......	......	......	......	......	0	0	0	0
Muskegon	33,963	10	10	2.94	2.94	3	2	.88	.59	1	1	.29	.29	1	1	.29	.29	15	14	4.42	4.12
Newaygo	17,436	7	6	4.01	3.44	2	2	1 15	1.15	......	......	......	......	......	......	......	......	9	8	5.16	4.59
Oakland	44,465	5	4	1.12	.90	1	1	.22	.22	......	......	......	......	......	......	......	......	6	5	1.35	1.12
Oceana	17,725	2	2	1.16	1.16	1	1	.58	.58	1	1	.58	.58	......	......	......	......	4	4	2.26	2.26
Ogemaw	5,707	1	1	1.75	1.75	......	......	......	......	......	......	......	......	......	......	......	......	1	1	1.75	1.75
Ontonagon	10,769	10	3	9.29	2.79	......	......	......	......	......	......	......	......	1	1	.93	.93	11	4	10.21	3.71
Osceola	18,781	9	9	4.79	4.79	......	......	......	......	......	......	......	......	1	1	.53	.53	10	10	5.32	5.32
Oscoda	1,683	0	0	......	......	......	......	......	......	......	......	......	......	......	......	......	......	0	0	0	0
Otsego	5,447	0	0	......	......	1	1	1.84	1.84	......	......	......	......	......	......	......	......	1	1	1.84	1.84
Ottawa	43,739	18	12	4.12	2.74	5	5	1.14	1.14	7	7	1.60	1.60	......	......	......	......	30	24	6.86	5.49
Presque Isle	7,441	......	......	......	......	1	1	1.34	1.34	......	......	......	......	......	......	......	......	1	1	1.34	1.34
Roscommon	1,187	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	0	0	0	0
Saginaw	81,314	16	16	1.97	1.97	4	4	.49	.49	2	2	.25	.25	......	......	......	......	22	22	2.71	2.71

TABLE 3.—CONCLUDED.

Counties.	Estimated population in 1899.*	Cerebro-spinal meningitis.				Meningitis.				Spinal meningitis.				Tubercular meningitis.				Total meningitis.			
		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of		Number of reported		Number per 10,000 population of	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Sanilac	35,640	8	6	2.24	1.68	2	2	.56	.56	......	......	......	......	1	1	.28	.28	11	9	3.09	2.53
Schoolcraft	8,763	2	2	2.28	2.28	......	......	......	......	......	......	......	......	......	......	......	......	2	2	2.28	2.28
Shiawassee	35,232	4	4	1.14	1.14	1	1	.28	.28	......	......	......	......	......	......	......	......	5	5	1.42	1.42
St. Clair	57,091	3	3	.53	.53	8	8	1.40	1.40	3	3	.53	.53	......	......	......	......	14	14	2.45	2.45
St. Joseph	24,751	10	6	4.04	2.42	2	1	.81	.41	4	4	1.62	1.62	......	......	......	......	16	11	6.46	4.44
Tuscola	36,792	8	8	2.17	2.17	4	4	1.09	1.09	......	......	......	......	......	......	......	......	12	12	3.26	3.26
Van Buren	31,707	2	2	.63	.63	......	......	......	......	2	1	.63	.32	......	......	......	......	4	3	1.26	.95
Washtenaw	45,133	7	5	1.55	1.11	3	3	.66	.66	1	1	.22	.22	......	......	......	......	11	9	2.44	1.99
Wayne	336,645	63	63	1.87	1.87	47	46	1.40	1.37	4	4	.12	.12	12	12	.37	.37	126	125	3.74	3.71
Wexford	17,508	39	29	22.28	16.56	4	4	2.28	2.28	7	6	4.00	3.43	......	......	......	......	50	39	28.56	22.28

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* Population estimated by average annual increase, arithmetical method, based on U. S. Census of 1890 and the State Census of 1894, computed in the office of the State Board of Health.

TABLE 4.—*Exhibiting by months, in each of the years 1872, 1873, 1898 and 1899, the number of deaths from meningitis, per 10,000 population in Michigan; also the average temperature for the said years, and for the series of years 1872-99, at the Agricultural College, Michigan. (The numbers of deaths are from reports of the Division of Vital Statistics, Department of State; the temperature is from records of observations at the Michigan Agricultural College.)*

Year, etc.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1872 * Meningitis	.06	.10	.24	.33	.30	.17	.14	.14	.17	.13	.04	.15
† Temperature	21.6	21.3	24.8	47.4	58.5	71.8	74.9	71.2	62.0	47.4	29.8	15.7
1873 * Meningitis	.50	.99	1.13	.95	.69	.46	.32	.37	.31	.21	.15	.19
† Temperature	15.9	19.1	28.3	43.2	57.0	70.6	70.8	69.5	57.4	44.7	28.5	29.5
1898 * Meningitis	.20	.15	.29	.29	.29	.26	.20	.22	.27	.23	.20	.21
† Temperature	26.2	24.4	37.6	44.4	58.4	69.2	73.0	70.5	63.6	50.4	34 4	26.0
1899 * Meningitis	.26	.41	.61	.86	.59	.32	.29	.26	.22	.17	.20	.14
† Temperature	21.8	16.2	27.3	51.4	59.8	70.2	70.7	76.6	58.6	54.1	40.0	26.5
Av. temp. 1872-99	21.81	22.95	30.36	45.71	58.00	67.68	71.19	68.86	60.66	48.50	35.28	27.06

* Includes all forms of meningitis reported.
† Degrees Fahrenheit.

Table 4 supplies data for a limited study of the seasonal prevalence of epidemic meningitis and its relation to temperature in Michigan. The years relative to which the data are used in Table 4 are chosen on account of their being epidemic years of the disease. It appears from the data that the season of greatest mortality is during the spring months (March, April and May) and that the rise and fall of the death-rate depends much on seasonal changes and especially on extremes of temperature.

The last line in Table 4, gives, by months, the average temperature at the Agricultural College for a series of years comprising 1872-99 inclusive; which may serve as basis for further study of the data contained in Table 4.

TABLE 5.—*Exhibiting the number of cases of meningitis which began and the number which were present in each month of the year 1899, in Michigan. (Compiled from reports to this office by health officers and physicians.) Also, by months, the average temperature, at stations in Michigan, in 1899.*

Cases.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Began	28	61	176	176	106	41	41	34	43	39	35	25
Present	33	80	295	361	263	132	100	82	79	74	72	54
Av. Temp	22.2	17.1	26.9	49.2	59.0	69.1	70.5	72.0	58.5	53.3	41.0	26.8

Table 5, based on data from an entirely different source from that from which those in Table 4 are derived, treats of *sickness* from meningitis in an epidemic year; and seems to be confirmatory of the evidence afforded by Table 4,—that epidemic meningitis is most prevalent in Michigan during the spring months, March, April and May.

Table 5 is based on statistics for a single year, and that an epidemic year. Therefore, conclusions based on those statistics alone, should not be considered final, and especially not relative to meningitis not epidemic.

TABLE 6.—*Exhibiting by sex, in certain age-groups, the reported number of cases (fatal and non-fatal) of sickness from meningitis of each name specified; also the totals for all meningitis, and the per cent the cases in each group were of the total number of reported cases. (Compiled from all reports for the year 1899 which stated the age.)*

Ages in groups of years.	Name of the disease.	Sex.	All known ages.*	Number and per cent of cases in certain age-groups.												
				Under 1 year.	1 to 4.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 and over.
No. of cases.	Cerebro-spinal meningitis.	Males	454	57	120	71	46	46	33	21	14	19	6	3	18
		Females..	339	43	97	55	36	25	22	13	11	8	9	10	10
Per cent the cases in each group were of all cases of known ages.		Males	100	13	26	16	10	10	7	5	3	4	1	.7	4
		Females..	100	13	29	16	11	7	6	4	3	2	3	3	3
No. of cases.	Spinal meningitis.	Males	68	18	17	8	3	12	2	1	1	1	1	2	2
		Females..	41	8	14	5	3	3	2	1	0	1	0	0	4
Per cent the cases in each group were of all cases of known ages.		Males	100	26	25	12	4	18	3	1	1	1	1	3	3
		Females..	100	20	34	12	7	7	5	2	0	2	0	0	10
No. of cases.	Meningitis.	Males	146	36	45	13	6	9	9	5	1	6	2	1	13
		Females..	96	16	37	11	5	3	5	7	3	0	2	3	4
Per cent the cases in each group were of all cases of known ages.		Males	100	25	31	9	4	6	6	3	.7	4	1	1	9
		Females.	100	17	39	11	5	3	5	7	3	0	2	3	4
No. of cases.	Tubercular meningitis.	Males	25	4	13	2	1	1	1	0	0	1	0	2	0
		Females..	13	3	1	2	2	3	0	1	0	0	0	1	0
Per cent the cases in each group were of all cases of known ages.		Males	100	16	52	8	4	4	4	0	0	4	0	8	0
		Females..	100	23	8	15	15	23	0	.8	0	0	0	8	0
No. of cases.	Total meningitis.	Males	693	115	195	94	56	68	45	27	16	27	9	8	33
		Females..	489	70	149	73	46	34	29	22	14	9	11	14	18
Per cent the cases in each group were of all cases of known ages.		Males ...	100	17	28	14	8	10	6	4	2	4	1	1	5
		Females..	100	14	30	15	9	7	6	4	3	2	2	3	4

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* Does not include those cases where the age was not stated.

Drs. Wright, Mallory and Councilman, in a report to the Massachusetts State Board of Health, published in the annual report of that board for the year 1898, p. 17, state as follows relative to the seasonal prevalence of meningitis:

> "Almost all the epidemics have appeared in the winter and spring. All of the early epidemics in Massachusetts were seen in the winter and spring. Woodward speaks of the disease in Litchfield county appearing in April, when the frost was dissolving and the ground breaking up, and says the disease seemed to be more common in rainy weather."

TABLE 7.—*Exhibiting by sex, in certain age-groups, the reported number of deaths from meningitis of each name specified; also the totals for all meningitis, and the per cent the deaths in each group were of the total number of reported deaths from meningitis.* (*Compiled from all reports for the year 1899 which stated the age.*)

Ages in groups of years.	Name of the disease.	Sex.	All known ages.*	No. and per cent of deaths in certain age-groups.											
				Under 1 year.	1 to 4.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 and over.
No. of deaths.	Cerebro-spinal meningitis.	Males	381	53	104	53	39	40	27	18	9	16	5	2	15
		Females..	270	41	82	41	29	19	13	8	8	7	5	7	10
Per cent the deaths in each group were of all deaths of known ages.		Males	100	14	27	14	10	10	7	5	2	4	1	1	4
		Females..	100	15	30	15	11	7	5	3	3	3	2	3	4
No. of deaths.	Spinal meningitis.	Males	61	18	16	6	2	10	2	1	1	1	1	1	2
		Females..	31	8	10	5	1	1	1	0	0	1	0	0	4
Per cent the deaths in each group were of all deaths of known ages.		Males	100	30	26	10	3	16	3	2	2	2	2	2	3
		Females..	100	26	32	16	3	3	3	0	0	3	0	0	13
No. of deaths.	Meningitis.	Males	145	36	45	13	5	9	9	5	1	6	2	1	13
		Females..	96	16	37	11	5	3	5	7	3	0	2	3	4
Per cent the deaths in each group were of all deaths of known ages.		Males	100	25	31	9	3	6	6	3	.7	4	1	.7	9
		Females..	100	17	39	11	5	3	5	7	3	0	2	3	4
No. of deaths.	Tubercular meningitis.	Males	25	4	13	2	1	1	1	0	0	1	0	2	0
		Females..	13	3	1	2	2	3	0	1	0	0	0	1	0
Per cent the deaths in each group were of all deaths of known ages.		Males	100	16	52	8	4	4	4	0	0	4	0	8	0
		Females..	100	23	8	15	15	23	0	8	0	0	0	8	0
No. of deaths.	Total meningitis.	Males	612	111	178	74	47	60	39	24	11	24	8	6	30
		Females..	410	68	130	59	37	26	19	16	11	8	7	11	18
Per cent the deaths in each group were of all deaths of known ages.		Males	100	18	29	12	8	10	6	4	2	4	1	1	5
		Females..	100	17	32	14	9	6	5	4	3	2	2	3	4

* Does not include those deaths where the age was not stated.

The same writers report that the outbreak in New York in 1892 and 1893 was most violent in May; that in the epidemic in Cologne in 1895, the greatest number of cases occurred in April; in Strasburg in 1841 the greatest number of cases were seen in March.

The foregoing statements of Drs. Wright, Mallory and Councilman, seem to agree with the evidence shown in Tables 4 and 5 of this article relative to the seasonal prevalence of epidemic meningitis in Michigan.

From Table 6 it would appear that meningitis is quite largely a children's disease, a considerable proportion of those affected being children under ten years of age. Of the 1,182 persons of known ages, included in Table 6, 185 (16 per cent) were infants under one year old; 529 (45 per cent) were under five years; 696 (59 per cent) were of ages under ten years.

Table 7 shows that of the 1,022 persons who died of the variously named meningitis in Michigan in 1899, 179 (18 per cent) were under one year old; 487 (48 per cent) were under five years of age, 620 (61 per cent) had not attained the age of ten years.

Very little reliance is placed on this material for the study of fatality; but, according to the reports, the greatest fatality from meningitis among the 1,182 persons attacked by it, whose ages were reported, was in children under one year old, of whom only six out of 185 (about three per cent) recovered. The least fatality was among persons of ages ranging from thirty to thirty-four years, of whom twenty-seven per cent recovered.

The average age of all decedents from meningitis, of whom the ages were reported, was, for males thirteen, and for females twelve years.

The average age of persons who died was as follows: Cerebro-spinal meningitis, males 13, females 12 years; spinal meningitis, males 10, females 12 years; meningitis, males 14, females 12 years; tubercular meningitis, males 9, females 13 years.

In Table 8 the statements "unknown," "sporadic," and "not reported" illustrate, in a measure, the difficulty of obtaining any definite, useful information relative to the source of the contagium of the disease and its mode, or vehicle of transmission from person to person. Of the 1,306 cases of the disease reported to have occurred in the State in 1899, the source of contagium of 1,173 was reported as "unknown," or were "not reported." Of the remaining 133 cases, only twenty-one were reported as having been traced to former cases of the disease. Fifteen were attributed to exposure, fourteen to injury, thirteen to la grippe, and eleven to influenza which is another name for the same disease; the other fifty-nine cases to a large number of other causes the study of which, however, is instructive, especially those like "followed bronchitis," "pneumonia," "followed otitis media," "result of cold," etc. It seems quite possible that hereafter such reports may become much more valuable.

Cause, or source of contagium of meningitis.

TABLE 8.—*Exhibiting, for each of the different names of meningitis, in Michigan, in 1899, the reported cause, origin, or source of contagium.*

Alleged source, origin, or cause.	Cerebro-spinal meningitis.	Meningitis.	Tubercular meningitis.	Spinal meningitis.	Total of all meningitis.
Traced to a former case	15	3	2	1‡	21
Probably traced to a former case	3	0	0	0	3
Unsanitary conditions	3	0	0	0	3
Outside jurisdictions	4	2	0	0	6
Unknown, sporadic, etc	289	28	5	21	343
Not reported	527	188	31	84	830
Result of cold	4	2	0	2	8
Result of la grippe	12*	1	0	0	13
Mental strain	1	0	0	0	1
Result of influenza	7†	2	1	1	11
Overwork	2	0	0	0	2
Result of fall	2	1	0	1	4
Syphilitic	1	2	0	0	3
Drinking large quantity of ice water	1	0	0	0	1
Followed bronchitis	1	0	0	0	1
Exposure	9	5	0	1	15
Result of injury	9	4	0	1§	14
Followed malarial fever	3	0	0	0	3
Chronic alcoholism	1	1	0	0	2
General debility	1	0	0	0	1
Teething	1	0	0	0	1
Cholera infantum	1	1	1	0	3
Pneumonia	3	2	1	1¶	7
Due to traumatism	1	1	0	0	2
Consumption	0	0	1	0	1
Whooping-cough	0	1	0	0	1
Dysentery	0	2	0	0	2
Lacked bony formation on base of brain	0	1	0	0	1
Ruptured blood vessel	0	1	0	0	1
Followed otitis media	0	1	0	0	1
Abscess	0	1	0	0	1
Totals	901	250	42	113	1,306

* One had la grippe but was supposed to be entirely over it.
† Suppuration of inner ear (one case).
‡ Inherited from father.
§ Injury to spine.
¶ Developed after pneumonia which she had six years ago.

In answer to the question asked in final report blanks, "previous to this case was there a case of cerebro-spinal meningitis, pneumonia, bronchitis, influenza, or consumption in any family in which the patient recently resided?" it was reported that in ten instances consumption, forty-four instances influenza, and in eleven instances la grippe had previously been in the family; in forty-one instances it was reported that some of the above-mentioned diseases had been in the family but the report did not state which; in eight instances spinal meningitis, and three instances each pneumonia, cholera morbus, cholera infantum, typhoid fever and scarlet fever had existed in the same families, prior to meningitis in some one of its forms.

Drs. Councilman, Mallory and Wright in their report to the Massachusetts State Board of Health, 1898, say:

> "Judging from the literature, the pneumococcus appears to be the organism most commonly associated with meningitis. Not only has it been found in most of the sporadic cases, but extensive epidemics are reported as having been caused by this organism. The fact that the pneumococcus organism was the first organism that was described in connection with acute meningitis, and that the first cases in which it was found were cases of meningitis secondary to pneumonia and acute endocarditis, has led to this organism being generally regarded as the cause of epidemic meningitis. We have found in our reports ten cases in which the pneumococcus was found, and so associated with the lesions of the disease that it can certainly be regarded as the cause. In eight of these cases the meningitis was secondary. In two there was a fracture of the base of the skull, extending across the temporal bone, the organism evidently gaining entrance into the meninges from the middle ear."

But, Drs. Councilman, Mallory and Wright apparently consider that it is not conducive to the highest truth to judge "from the literature" alone, the idea is conveyed that the bacteriology of meningitis was not worked out until within comparatively recent times, and that epidemic meningitis is caused by the Diplococcus intracellularis meningitidis.

In a monograph in 1899, entitled "Epidemic Cerebro-spinal Meningitis," W. J. Class, Medical Inspector Chicago Health Department,* relative to the cause of epidemic cerebro-spinal meningitis, says:

> "Biggs, in a series of cases from which cultures were made, found no one constant organism; the majority of the cases showed the Diplococcus pneumonia, which he considers as the chief etiological factor; other organisms found were the pneumococcus of Friedlaender, bacillus of influenza, and the Streptococcus pyogenes; in one case the Bacillus coli communis was found in the exudate from the base of the brain. In cases complicated with dysentery, occurring during the epidemic at Lonaconing, the stools, according to Flexner and Barker, contained an organism identical with the Miccrococcus lanceolatus. Klemperer found pneumococci in watery contents of herpes, occurring in cases of cerebro-spinal meningitis. Onadu found the diplococcus of pneumonia in the blood of a meningitis patient."

Numerous other conclusions by different investigators are given and the author draws the following conclusion:

> "If the meningococcus and the gonococcus are not identic organisms, they are at any rate closely related."

The following quotations from correspondents of this office contain further statements suggestive of predisposing, or contributory factors in the acquirement and transmission of meningitis.

> "Patient complained of not feeling well on the 10th instant. Thought he was coming down with grip. Had aching in legs and back. In the evening he took a hot bath and went to a large party, but not feeling well remained only an hour. This patient had fever through the night and some delirium."—*E. T. Ellis, M. D., health officer Manistee city.*

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* Reprint from Journal of American Medical Association, March 25, 1899.

"One case, I think, was due to exposure, wet feet and severe cold; taken with chills, vomiting, pain in back and head. One case from exposure, overwork, taken with vomiting, pain in head."—*Dr. E. Morgan, Manton village, Wexford county.*

"The first (case) had received a slight injury some little time before his sickness, but was apparently in good health at the time of being taken down. No other known cause, do not know cause for second (case) except from former case."—*L. Cochran, health officer Elk township, Sanilac county.*

"This case had fallen in river and suddenly chilled, the day before taken sick; believe this meningitis resulted from pleurisy, it being apparently the first sickness."—*B. Franklin Johnston, health officer Caulkinsville, Isabella county.*

"Exposure, by taking child out into the cold, damp weather."—*E. A. Runyan, M. D., health officer Harbor Springs, Emmet county.*

"Mrs. W——————, living a few rods away from C——————, assisted in caring for C——————, was taken sick about one week after and died."—*W. H. Young, M. D., health officer Castleton township, Barry county.*

"In the case of Albert Bates, he was an illy nourished and poorly clothed child during the winter. On November 20, 1898, another boy threw a stone and hit him on the head about the middle of the right parietal bone, cutting the scalp about two inches and fracturing the outer table of the skull. The boy at this time had sores on his face and scalp, corners of mouth, nose and ears, that had been there for some time. He was anemic. Before I arrived at the house the mother had gathered spider webs, dust and all, and packed in the wound to stop the hemorrhage. With the best antiseptic treatment and tonics that I could give the boy the wound did not heal over till about the first of April. April 15 he was bitten by a dog; the skin was not broken but he was badly frightened. April 16 at 3:00 p. m., he was taken with vomiting and pain in the occipital region but no chill. April 17, at 9:00 a. m., I was called and found the boy unconscious, 104 F. He would rave and toss around for ten or fifteen minutes and then lie more quiet until he had rested from twenty to thirty minutes and then another paroxysm. When lying quiet his head was drawn back and spine curved. I am of the opinion that the real cause was a septic condition caused by the wound on his head and shock from fright by being bitten by the dog the day before."—*E. J. Pendelt, M. D., Marshall, Calhoun county.*"

Doctor Henry B. Baker, in a committee report to the Michigan State Board of Health in 1874,* said:—

"It is extremely probable, but not yet proved, that any substance or agency which causes unusual contraction of the non-striated muscular tissue throughout the body is capable of being a prominent cause, and any substance, agent, bodily position, condition, sensation, or emotion, which tends to produce general muscular tension, or otherwise to force unduly the blood into the blood-vessels of the brain and spinal cord, is capable of contributing to the production of this disease."

Throughout the literature of the subject, and in reports of cases to this office, there is much evidence to this effect. The influence of the action of cold seems now to be established. And this view is consistent with the view that meningitis is caused by micro-organisms which gain access to the meninges.

No non-fatal cases of "tubercular meningitis" were reported in 1899, and only two non-fatal cases of "meningitis," both being males of which the duration of sickness was respectively seven and thirty-one days.

The average duration of sickness of fatal cases of meningitis in Michigan in 1899, was as follows:—Cerebro-spinal meningitis, males 11 days, females 3 days; spinal meningitis, males 7 days, females 12 days; meningitis, males 13 days, females 12 days; tubercular meningitis, males 23 days, females 21 days; total, males 11 days, females 8 days.

The average duration of non-fatal cases of meningitis was:—Cerebro-spinal meningitis, males 24 days, females 25 days; spinal meningitis, males 29 days, females 26 days; total, males 28 days, females 25 days. There were only two non-fatal cases of "meningitis," one lasting seven and the other thirty-one days. No cases of tubercular meningitis were reported except those which were fatal.

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* Annual report of State Board of Health 1874, pp. 117-193.

TABLE 9.—*Exhibiting, by sex, in days and periods of days, the duration of sickness in fatal and non-fatal cases of variously named meningitis in Michigan, in 1899; showing the per cent of all cases of which the duration was reported, which terminated each day and in each period of days, of sickness.*

	Sex.	No. of cases included.	Duration of sickness.—Total cases.																						
			Per cent terminated in each day of sickness.															Per cent terminated in each period of days of sickness.							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16 to 20	21 to 25	26 to 29	30 to 35	36 to 40	41 to 45	46 to 50	51 and over
Cerebro-spinal meningitis	Males	244	13	10	12	10	7	7	6	3	1	2	3	2	2	4	2	5	3	3	4	1	2	0	2
	Females	77	19	17	25	12	13	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meningitis	Males	59	10	0	14	7	3	7	5	2	3	5	3	3	3	3	5	7	5	3	3	2	0	3	2
	Females	52	17	10	4	4	2	2	8	10	2	4	0	2	2	6	0	4	10	8	4	2	0	2	0
Spinal meningitis	Males	40	13	23	13	13	5	8	3	3	3	0	0	0	3	3	0	8	5	0	0	3	0	0	0
	Females	19	11	5	16	5	0	0	11	0	5	16	5	0	5	0	0	5	5	0	0	5	0	0	5
Tubercular meningitis	Males	16	0	0	6	6	0	0	19	0	0	6	0	0	0	6	0	13	1	13	6	0	6	6	6
	Females	6	0	0	0	0	0	0	0	0	0	17	17	17	0	0	0	17	0	17	0	0	17	0	0
Total	Males	359	12	9	12	9	6	7	6	3	1	3	3	2	2	1	2	6	4	3	3	1	2	1	2
	Females	154	17	12	16	8	7	8	4	3	1	4	3	1	1	2	0	3	4	3	1	1	1	1	1
Duration of sickness.—Non-fatal cases.																									
Cerebro-spinal meningitis	Males	65	0	2	3	2	0	0	5	3	5	3	3	0	3	0	3	22	17	6	6	6	3	2	8
	Females	60	3	2	0	5	2	2	2	5	0	5	2	3	0	5	0	13	17	5	7	7	3	3	10
Spinal meningitis	Males	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	80	....	....	....	....	....	20
	Females	10	....	....	....	....	10	....	....	10	....	....	....	....	....	....	....	....	50	....	10	....	10	....	10
Total	Males	70	0	1	3	1	0	0	4	3	4	3	3	0	3	0	2	20	21	6	6	6	3	1	9
	Females	70	3	1	0	4	3	1	1	6	0	4	1	3	0	4	0	11	21	4	7	6	3	4	10

Bearing on the seasonal prevalence of meningitis and its causation, the following extracts from articles written on this subject by Secretary Baker of this Board are pertinent:

Meningitis.—In the paper which he read before the Upper Peninsula Medical Society, July, 1899, he presented tables and diagrams proving that, in Michigan, *epidemic* meningitis occurs when those conditions which in ordinary years are coincident with the greatest prevalence of the diseases of the air-passages, are intensified; the principal conditions being atmospheric cold and ozone; that the epidemic is most general in those parts of the State in which the cold and ozone are most pronounced; that in non-epidemic years there are two seasons of increased prevalence of what is reported as meningitis,—one, as in epidemic years, following the greatest prevalence of the diseases of the air-passages, in the spring; the other in August, coincident with the greatest prevalence of intestinal diseases. In that paper he said:—"The diagrams and other evidence put before you today seem to prove that *epidemic* meningitis in Michigan occurs in the spring, and is dependent either upon influenza, pneumonia, tuberculosis, and the other germ-diseases which usually enter the body by way of the air-passages, during and following the exposure to cold, dry, ozonized atmosphere, or it is caused by germs which are effective under conditions similar to those which favor the spread of those diseases.

"It seems also to be proved that, excluding those years in which meningitis was epidemic and unusually prevalent, the disease usually followed, and may be believed to have been, in some way, dependent upon enteritis and the diarrheal diseases following the hot weather in summer. Whether or not the meningitis so generally prevalent in August is caused by the Diplococcus intracellularis, I have no certain knowledge; and I hope bacteriologists will take early opportunities to learn; but whether caused by that germ or by the same micro organisms which cause the enteritis,—such organisms as the streptococcus, and Bacillus coli, I believe that the summer meningitis as well as the myelitis, will be prevented whenever the diarrheal diseases of summer are prevented; and that *they* will be prevented through asepsis of foods and drinks, and especially lessened by the use of sterilized milk."

The following tables contain and the diagrams graphically exhibit interesting facts upon which are based statements made in this article.

TABLE 10.—*Exhibiting, by months, the aggregate number of reported deaths from cerebro-spinal meningitis, spotted fever, spinal meningitis and spinal fever in Michigan during the epidemic year 1873; also the number of deaths in equalized months of thirty days, and the average temperature at the Michigan Agricultural College by months in the same year.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Reported deaths...........	65	128	147	123	90	59	41	48	40	27	20	24
Deaths in months of 30 days....................	63	137	142	123	87	59	40	46	40	26	20	23
Average temperature......	15.87	19.10	28.30	43.17	56.98	70.60	70.82	69.49	57.38	44.68	28.49	29.54

The statements in the second and third lines of Table 10 are graphically exhibited in the diagram, Plate 1088, page 237.

TABLE 11.—*Exhibiting by months the total reported deaths in Michigan from cerebral meningitis, spinal meningitis, meningitis and cerebro-spinal meningitis for the twenty years, 1877-96; also the average atmospheric temperature at stations in Michigan for the same period.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Reported deaths...........	168	190	234	239	214	197	214	242	193	169	145	193
Deaths in months of 30 days...............	163	204	227	239	207	197	207	234	193	164	145	187
Average temperature, 1877–1896.................	21.42	23.30	29.74	44.89	56.35	66.55	70.78	68.19	61.41	49.06	36.17	28.11

The statements in the second and third lines of Table 11 are graphically exhibited in the diagram, Plate 1089, page 238.

TABLE 12.—*Exhibiting by months the total number of deaths in Michigan from cerebro-spinal meningitis during the year 1898 (under new law); also the average atmospheric temperature reported by 108 observers.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Reported deaths...........	29	22	35	38	46	39	31	40	41	28	27	29
Deaths in months of 30 days....................	28	24	34	38	44	39	30	39	41	27	27	28
Average temperature, 1898*....................	23.9	22.4	35.4	42.3	55.1	65.7	69.9	67.4	63.0	49.1	34.6	23.1

* Report of Chief of the Weather Bureau, U. S. Department of Agriculture, 1898-9.

The statements in the second and third lines of Table 12 are graphically exhibited in the diagram, Plate 1090, page 239.

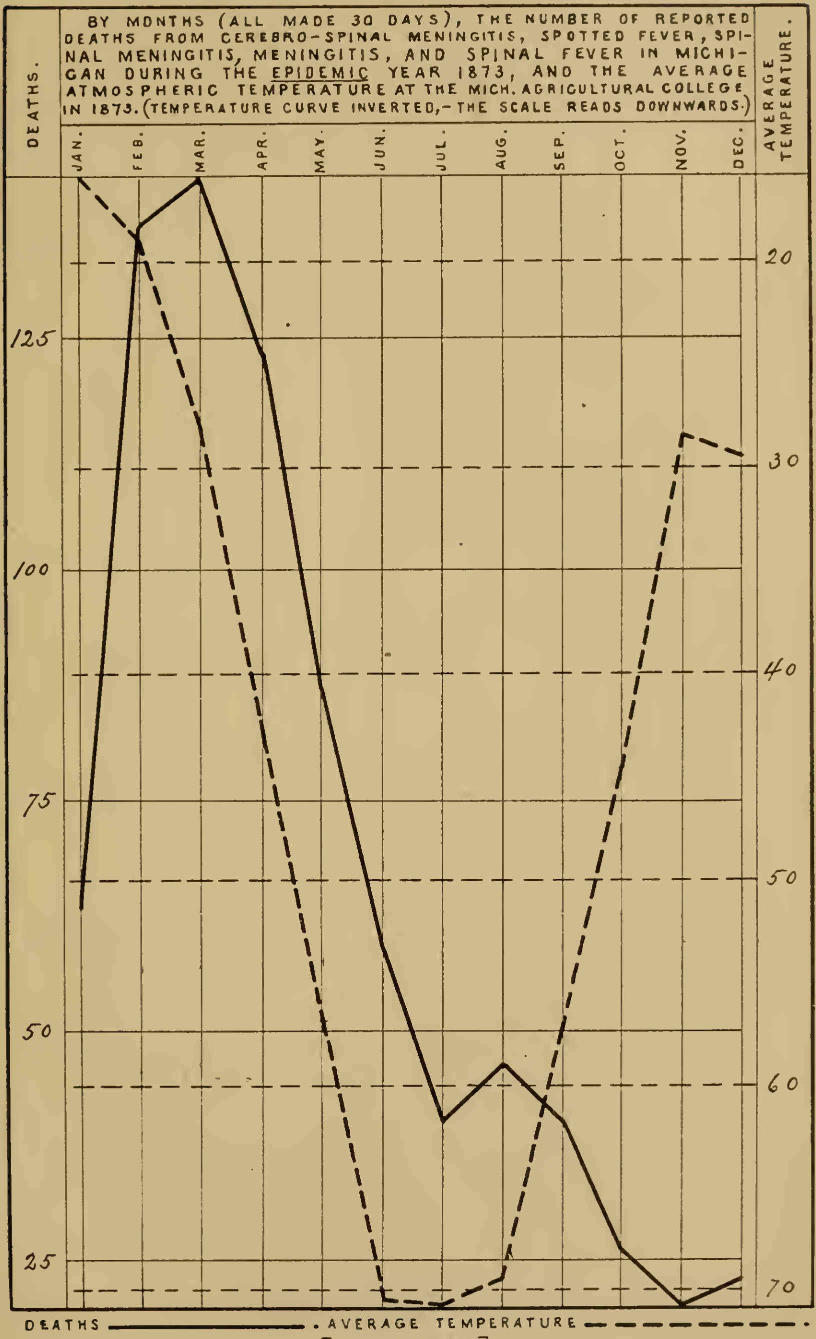
TABLE 13.—*Exhibiting by months, the total number of deaths in Michigan from cerebro-spinal meningitis during the year 1899 (under new law), and the average atmospheric temperature for the same year reported by 101 observers.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Reported deaths...........	46	74	127	170	133	55	52	45	47	26	32	24
Deaths in months of 30 days....................	44	79	123	170	129	55	50	44	47	25	32	23
Average temperature, 1899*.....................	19.1	14.1	23.6	46.7	56.3	65.9	68.4	69.1	56.9	52.3	40.6	26.1

* Report of the Chief of the Weather Bureau, U. S. Department of Agriculture, 1899.

The statements in the second and third lines of Table 13 are graphically exhibited in the diagram, Plate 1091, page 240.

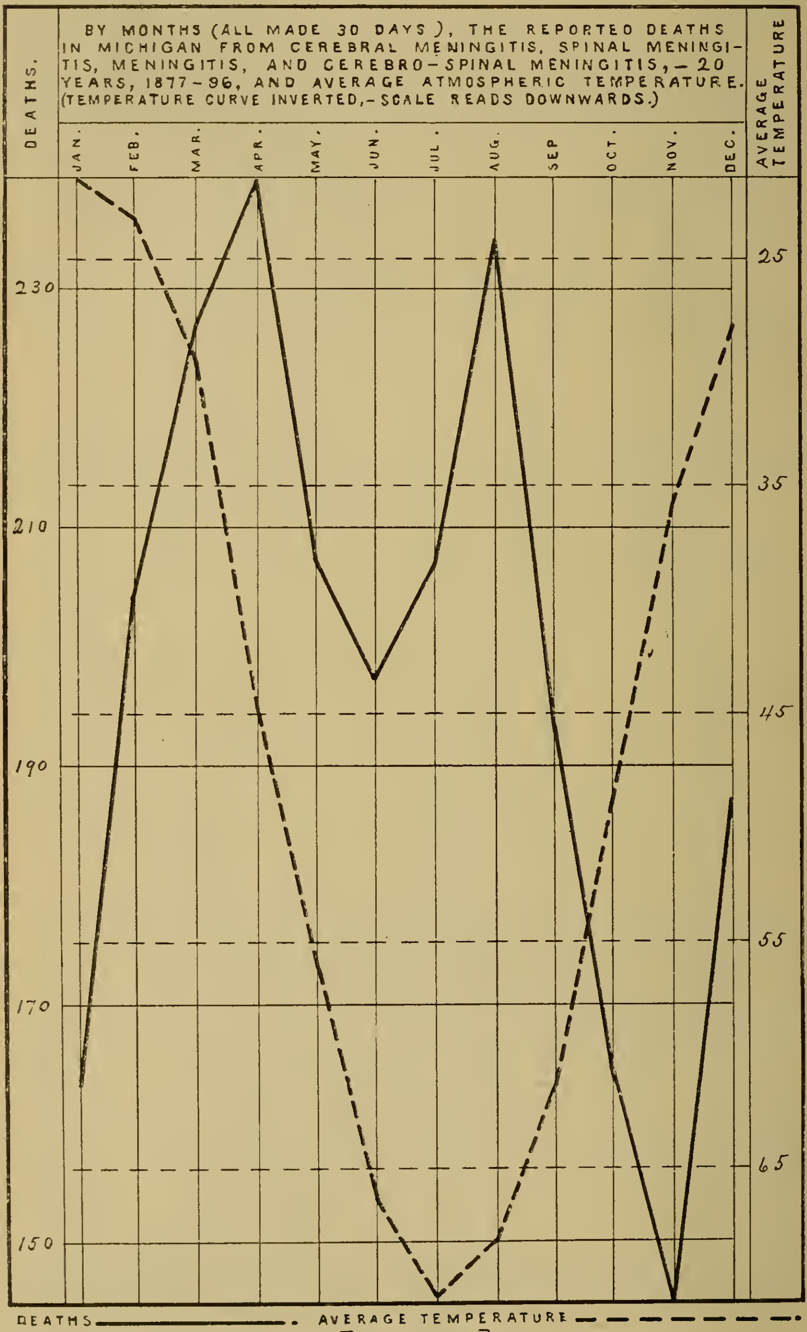
ATMOSPHERIC TEMPERATURE, AND DEATHS FROM MENINGITIS IN MICHIGAN IN THE YEAR 1873.—EPIDEMIC YEAR.



BY MONTHS (ALL MADE 30 DAYS), THE NUMBER OF REPORTED DEATHS FROM CEREBRO-SPINAL MENINGITIS, SPOTTED FEVER, SPINAL MENINGITIS, MENINGITIS, AND SPINAL FEVER IN MICHIGAN DURING THE EPIDEMIC YEAR 1873, AND THE AVERAGE ATMOSPHERIC TEMPERATURE AT THE MICH. AGRICULTURAL COLLEGE IN 1873. (TEMPERATURE CURVE INVERTED,—THE SCALE READS DOWNWARDS.)

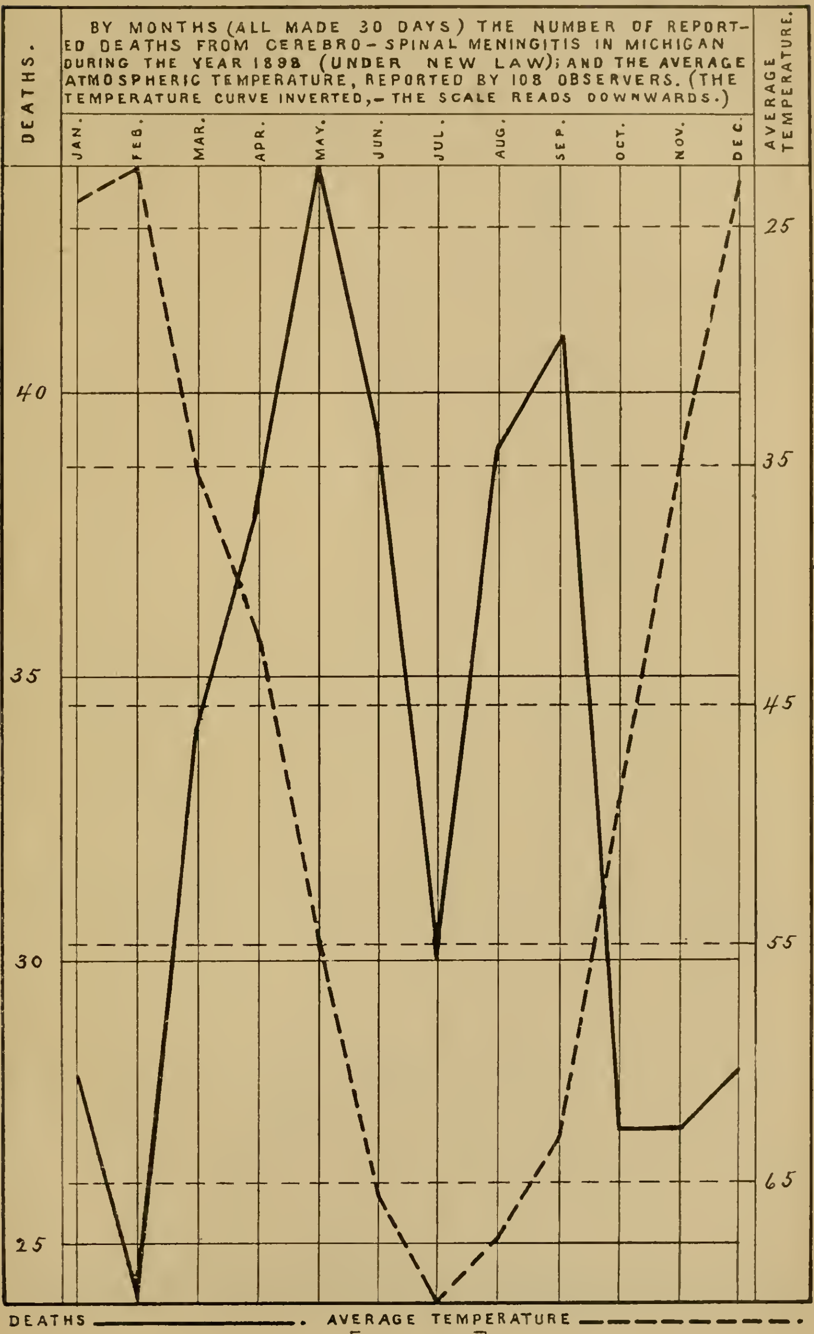
[PLATE 1088]

ATMOSPHERIC TEMPERATURE AND DEATHS FROM MENINGITIS IN MICHIGAN, — 20 YEARS, 1877–96.



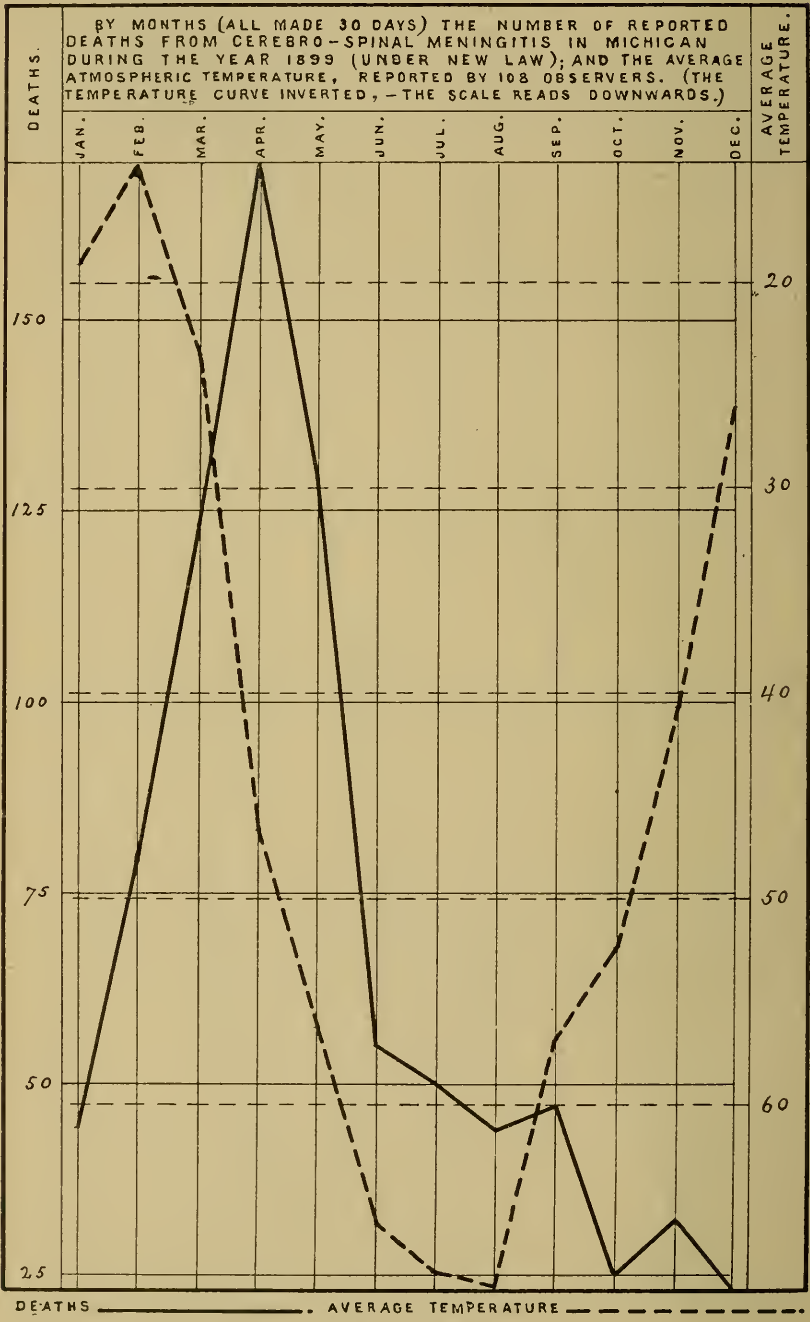
[PLATE 1089]

ATMOSPHERIC TEMPERATURE, AND DEATHS FROM MENINGITIS IN MICHIGAN.— 1898. (REPORTED UNDER NEW LAW.)



[PLATE 1090]

ATMOSPHERIC TEMPERATURE, AND DEATHS FROM MENINGITIS IN MICHIGAN.—1899. (REPORTED UNDER NEW LAW.)



[PLATE 1091]

The following short article, by Secretary Baker of this Board, printed in the Grand Rapids Herald for the purpose of popular instruction, is here inserted for the same purpose:

"*The causation, prevention and restriction of meningitis.—The importance of meningitis as a cause of deaths,* may be seen by the fact that during the year 1898, the deaths reported to the Secretary of State, from all forms of meningitis, were nearly 800; being more than from typhoid fever, or diphtheria and croup, and more than were reported from scarlet fever, measles, whooping-cough and smallpox combined.

"During the first nine months of 1899 the reported deaths from meningitis, not including plain 'meningitis' and 'tubercular meningitis,' were over 700; being more than from typhoid fever, or diphtheria and croup, and twice as many as from scarlet fever, measles, whooping-cough and smallpox combined.

"*What meningitis is.*—Meningitis is an inflammation of the meninges or membranes covering the brain and spinal cord, which is sometimes caused by the Bacillus tuberculosis, which is the same germ that causes consumption, by the specific germs of pneumonia, by the influenza bacillus, by the Bacillus typhoides, which is the germ that causes typhoid fever, by the anthrax bacillus that causes malignant pustule, and by the streptococci—such germs as those which cause erysipelas. Recently, still another germ has been proved to be generally present in *epidemic* meningitis; and it is now thought that it is the primary cause of most of the meningitis. It is named the *Diplococcus intracellularis meningitidis,* which is only the short way of stating that it is a double-celled, round micro-organism, uniformly found in the cells themselves in inflammation of the membranes of the brain and spinal cord.

"Knowledge of the *specific* cause or causes of the disease is not sufficient to explain why it occurs at some seasons of the year much more generally than at others, and in the coldest parts of a State much more generally than in others; but the statistics compiled in the office of the State Board of Health prove that the epidemic meningitis is usually most prevalent in April, following the coldest weather, and following, or coincident with the time of greatest prevalence of those diseases, the specific germs of which have been found in the inflamed meninges—such diseases as are known to be increased after exposure to atmospheric cold—namely, influenza, pneumonia and consumption; consumption itself being most prevalent in April.

"From the evidence collected, it is plain that meningitis is increased by whatever increases those diseases of the air-passages, the germs of which are able to gain entrance to the circulating blood. Diphtheria prevails at about the same time, but its germs do *not* generally enter the blood; they mostly remain in the throat, and diphtheria germs have not been found to be a cause of meningitis, which seems to be caused by any germs which enter the blood; but does not occur except some unusual influence tends to cause an exudation from the blood vessels into the lymph spaces under the membranes; and that influence is probably increased pressure in the blood-vessels of those parts, which is sometimes caused by chilling the surface of the body, thus by surface contraction forcing the blood into the brain and spinal cord. Probably this is why during the first five months of 1899 more deaths were reported from meningitis than for any one of the twenty-eight full years ending with 1896, with the exception of the epidemic year 1873: because the atmospheric temperature in December, 1898, was more than five degrees lower than the average December in the twenty years, ending with 1896; the temperature for January, 1899, was nearly five degrees lower than the average for the ten years ending with 1898. The temperature in February, 1899, was the lowest on record since 1885.

"*How to avoid the disease.*—Every person should avoid exposure to sudden chilling of the surface of the body; this is important at such times as the diseases, the germs of which are associated with meningitis, are most prevalent—during and following the coldest weather (and, as shown further on, also following the hottest weather), and this is most important when the person is known to have been exposed to the germs of one of those diseases.

"But the great difficulty of controlling or avoiding atmospheric cold is a powerful reason for greater efforts for the restriction of the spreading movements of those germs which are now known to be the specific causes of those diseases—influenza, pneumonia, and consumption, the germs of which have been so many times found as the apparent cause of meningitis. These diseases are usually spread by means of atmospheric dust, of which the germs sometimes constitute a part. Some of the chief sources of danger are: Infected handkerchiefs, dust from floors or articles upon which infected sputum or saliva has been ejected, contact with the hands of persons who cough into their hands or who handle infected handkerchiefs, dust from rooms or clothing infected by a person having one of these diseases.

"There is very much more involved in the recent movement for discouraging promiscuous spitting than is apparent to the casual observer. It means the lessening of most of the important causes of premature deaths, including meningitis.

"*How disease is spread.*—But an exceedingly important measure not yet attracting the attention which its great importance demands, is the prompt disinfection of every handkerchief as soon as once used, before any secretion from the nose has had time to dry and thus scatter the seeds of some disease, which germs are now almost always, when inhaled, caught in the mucus in the nose, one function of which in health is to stop the entrance of disease germs into the body, and from whence they should be ejected and promptly disinfected. Such facts as these concerning how dangerous diseases are spread and how they might be restricted, are now required to be taught in the public schools of this State. Until these facts are learned by the people generally, and acted upon, meningitis and the allied diseases will continue to prevail, whenever the atmospheric conditions are favorable to them.

"One more series of facts should be stated,—that, although *epidemics* of meningitis usually prevail in the spring of the year, and are caused by cold and germs, there is a secondary maximum of prevalence of meningitis usually in August, but sometimes in September, coincident with or following the diarrheal and intestinal diseases which are most prevalent in August, at which times the germs which cause the meningitis probably enter the blood by way of the intestines. In order to prevent the meningitis of summer, therefore, it is necessary to prevent the intestinal diseases, and this must be done by destroying the germs in the drinking water, milk, and other foods.

"The testing of all dairy cows by tuberculin, and rejecting the milk of all cows found thereby to have tuberculosis, would go far toward the prevention of tubercular meningitis, and that is one of the worst forms of meningitis."

CANCER.

A correspondent wrote to this office stating that complaint had been made that a young man who has cancer in his mouth was in the habit of drinking from the cups at the public watering places; and requested that said young man be advised to discontinue this practice.

In accordance with this request the secretary of this Board wrote to the young man as follows:

"This office has been requested to address you and to respectfully suggest that as it is known that all specific diseases are spread from person to person, directly or indirectly, it is incumbent upon every person suffering from any such disease to exercise great care that other members of the family, personal friends, or others do not contract the disease from them. Disease is sometimes unintentionally communicated by drinking from the same cups, owing to the fact that many persons suffering from such a disease are not aware of the great dangers to which they sometimes subject their friends by way of handkerchiefs, towels, drinking cups, etc.

"It is alleged that you are yourself suffering from some disease of the mouth which you may have contracted in some such manner, and, if so, may be spread to others unless great care is exercised."

ERYSIPELAS.

During the year ending December 31, 1899, special reports of the presence of twenty-seven cases and two deaths from erysipelas were made to this office from ten localities in Michigan as follows: From Richland township, one case; Albion city, two cases and one death; Assyria township, one case; Coldwater city, one case; Kalamazoo city, fourteen cases; Fremont township, one case; Cheboygan city, one case; South Haven township, one case and one death; Sutton's Bay township, one case, and Silver Creek, four cases.

These instances of erysipelas do not represent all erysipelas which occurred in the State in 1899.

Reference to page 63 of this report shows that 10 per cent of all the 5,126 card reports received at this office during the year showed presence of the disease in localities in Michgan at various times.

PUERPERAL FEVER IN MICHIGAN IN 1899.

During the year 1899, one non-fatal and three fatal cases of puerperal fever were reported to the office of the State Board of Health. The fatal cases occurred in May, July and October, respectively, in the village of Holly, the township of Arcadia, in Manistee county, and the village of Barryton; the non-fatal case was in McBain, in January.

The above-mentioned cases must not be understood to include all the cases of puerperal fever which occurred in Michigan in 1899, for of the 5,126 postal-card reports received at this office during the year 1899 from observers in different parts of the State, 98, or about 2 per cent, stated the presence of puerperal fever in the localities from which the reports were sent.

Puerperal fever a dangerous communicable disease.—The question arose in a case of puerperal septicemia, whether or not it was a dangerous communicable disease. In a letter from Health Officer S. A. Lewis, M. D., of Barryton, October 27, 1899, he asks the question as follows:

> "Must a case of puerperal septicemia be reported as a disease dangerous to the public health.
>
> "Mrs. ——— died today in this town of puerperal septicemia. The attending physician thinks clothing and house should be disinfected, and that they have no right to hold a public funeral.
>
> "I have ordered soiled clothing to be burned and rest of bedding to be thoroughly disinfected."

Answering the above letter, the secretary replied as follows:

> "***** I think that you should act upon the recommendations of the attending physician relative to the disinfection of the clothing and house."

ANIMALS DISEASES DANGEROUS TO MAN, IN MICHIGAN, YEAR ENDING DECEMBER 31, 1899.

Whenever information is received at this office of the occurrence of an outbreak of any disease of animals, which by reason of its communicability may be considered dangerous to man, efforts are made to learn all facts relative to such outbreak. If it is found that, in the progress of such an outbreak, any person or persons have become, or are in danger of becoming, infected with the contagium of such disease, the attention of the health officials of the locality where the disease is reported present is called to the fact of its reported prevalence, and they are requested to take measures for the prevention of its spread, etc.. If on the contrary, it is found that there exists no danger of infection of human beings, the report of the outbreak is referred, by the secretary of this Board, to the State Live Stock Sanitary Commission, whose duty it is to investigate all outbreaks of communicable diseases in animals, and to prescribe necessary measures for their restriction and prevention among animals.

During the year 1899, outbreaks of tuberculosis (in cattle), glanders, actinomycosis (lump jaw), rabies (hydrophobia), and hog cholera, were reported to this office from various parts of the State, a brief history of each of which follows:

TUBERCULOSIS IN CATTLE IN MICHIGAN IN 1899.

During the year ending December 31, 1899, there were five instances of tuberculosis in cattle reported to the office of the State Board of Health as follows: One in Charlevoix, one in Owosso, one in Flint, one suspected case in West Bay City, and one in Akron.

Tuberculosis in cattle in Charlevoix.—Relative to this instance, J. B. Theilen, M. D., wrote to this office:—

> "A cow belonging to Mr. E——— gives every appearance of having tuberculosis. Until February last, it was owned by Mr. M——— and the milk was used in his family. Within the last week Mr. M———'s lungs have been examined by three physicians and all found them both affected with the germ, and it is feared other members of his family are affected. He sold the cow on this account, but Mr. F——— was informed, but as I understand it he has the cow with the rest of his stock and uses the milk, but I cannot vouch for this."

This instance in Charlevoix, shows the danger of permitting the use of milk from infected animals.

Commendable position of the Owosso Board of Health.—In regard to the outbreak in Owosso, the following letter was received from W. E. Ward, M. D., health officer:—

"On Tuesday, September 26, President Brown and Secretary Tyler of the State Live Stock Commission, and State Veterinarian Dunphy came to this city at our request and began a test for tuberculosis on a herd of sixteen cows in this city. One cow reacted and post-mortem examination made the following day, September 27, showed well marked case of alimentary tuberculosis. It is the intention of our board to cause all cows which furnish milk for this city to be tested with tuberculin."

Later communication from Mr. Ward developed the fact that only one of the herd mentioned reacted. It was also learned that the measures proposed by the board of health, to require that all cows, the milk from which is to be used for sale in the city, should be tested for tuberculosis, was rejected by the common council.

Tuberculosis in cattle in Flint.—Relative to this instance, P. Haseltine wrote as follows:—

"I hereby report the result of a post-mortem held on a cow that died from tuberculosis, the property of Flint P. Smith of this city. History of the case is as follows:

"The cow was purchased in Ionia, I think, shortly before Christmas, was a shorthorn and registered, kept for breeding purposes only up till the time of her death, and kept separate from the other cattle. After parturition she commenced to run down in general condition. Not much of any attention was paid, thinking the cause was due to the calf nursing. After she was placed on grass (separate from all other cattle) she picked up again in flesh and for a time appeared to thrive till all at once she took a turn and broke right down and died. I was called to investigate the cause of her death. The post-mortem revealed a general well developed case of tuberculosis. The remains were buried four feet below the surface in a remote part of the farm, and all surroundings disinfected. The calf is kept isolated to see if any sign of disease shows itself. No signs of tuberculosis exist in the remaining herd."

MILK INSPECTION, AND TUBERCULIN TESTING OF DAIRY COWS.

Relative to this subject the health officer of the city of Lansing, April 17, 1899, wrote to this office as follows:—

"Should I remain health officer of Lansing next year I desire to secure the passage by our common council of a *milk ordinance*.

"In my opinion there is great need of a better regulation of the sale of milk in this city, and the proper examination of milk and herd should be instituted at as early a period as possible. I am a firm believer in the great possibilities of the spread of disease-producing germs in the improper milk supply, and particularly of the tubercle-bacilli.

"I have secured a copy of ordinances already in force in some of the cities of Michigan for examination, but would be glad of any aid I could secure from you.

"Any suggestions you can offer will be thankfully received."

In reply to the above quoted letter, the secretary of this Board, April 18, 1899, wrote:—

"Your letter of yesterday, relative to milk inspection, is before me. In compliance therewith I send you herewith a copy of the milk ordinance of the city of Jackson, Michigan, passed March 20, 1899.

"This office has prepared a bill 'To provide for the testing of all milch cows the milk from which is sold in cities and villages, and to stop and prevent the sale of milk from tuberculous animals.' It is *Senate Bill No.* 408. My belief is that this is of more importance than any milk ordinance that can be passed, unless the ordinance makes provisions similar to those in this bill; and, even then, a State law is preferable. But I quite agree with you that an ordinance such as you suggest is important.

"I hope you will use your influence for the passage of Senate Bill No. 408, introduced by Senator Collingwood."

The bill failed to become a law. As slightly modified for presentation to the legislature of 1901, it is as follows:

A BILL to provide for the testing of all milch-cows the milk from which is sold for use in incorporated cities and villages, and for stopping and preventing the sale of milk from animals proved to be tuberculous.

The People of the State of Michigan enact:

SECTION 1. That, from and after January 1 in the year nineteen hundred and two, it shall not be lawful to sell milk for use in any incorporated city or village in Michigan without a license, issued by the local board of health, authorizing the sale of milk from each and every animal from which the milk is obtained, and without said license shall have been obtained or renewed within the calendar year in which the milk is sold.

SEC. 2. No local board of health or health official shall issue a license authorizing the sale of milk for use in any incorporated city or village, except the license be based upon a written report, relative to each and every animal the milk from which is licensed to be sold, made by the State Live Stock Sanitary Commission or an officer or authorized agent of that Commission (which agent the Commission is hereby authorized to appoint), and stating that to each and every carefully described animal the tuberculin test has been applied, and that it is believed by said Commission, officer, or agent that each animal is free from tuberculosis: *Provided*, That, relative to an animal tested by tuberculin in the preceding year, the tuberculin test may be waived at the discretion of an officer of the State Live Stock Sanitary Commission, under certain circumstances, as specified in the succeeding section of this act.

SEC. 3. It shall be the duty of the State Live Stock Sanitary Commission, as soon as practicable after receiving an application from a dairyman, or from a health official of any incorporated city or village, to apply the tuberculin test, or to cause the tuberculin test to be applied by a competent veterinarian or expert satisfactory to the Commission, to all cows the milk of which it is proposed to sell for use in any incorporated city or village in Michigan, and to give to the local board of health, in writing, a careful description of each such animal tested, and a plain statement relative to each animal whether or not the Commission, officer, or authorized agent of the Commission believes that the animal is free from tuberculosis: *Provided*, That in case it shall be proved to the satisfaction of a State Live Stock Sanitary Commissioner by witnesses under oath, which oath the Commissioner is hereby authorized to administer, that an animal, which in the preceding year has been tested by tuberculin by the Commission or its authorized agent, and found free from tuberculosis, has not since that test been in any way exposed to tuberculosis by being in infected premises, near infected animals or persons, or in any other manner, and that the animal is free from the disease, it shall be lawful for an officer of the State Live Stock Sanitary Commission to waive the requirement for the tuberculin test in that year, in which case the officer of the Commission shall advise the local board of health of the fact of the test having been waived and of the belief of said officer that the animal is free from tuberculosis.

SEC. 4. Whenever a health officer or local board of health shall receive from the State Live Stock Sanitary Commission, or an officer, or authorized agent of that Commission, a written report stating that an animal tested by tuberculin under the direction of said Commission has been found to be tuberculous, and that in the opinion of the Commission, officer, or authorized agent, no milk from that animal should be permitted to be sold, or that the animal should be ordered quarantined or isolated in order to protect either animals or mankind, it shall be the duty of the health officer or local board of health so notified, to so order that no milk of that animal shall be sold, and the isolation of said animal shall be maintained in accordance with the written advice of the State Live Stock Sanitary Commission, its officer, or authorized agent.

SEC. 5. It shall be the duty of every local board of health to cause to be made a permanent record of all licenses issued by it under this act, and to file and preserve all reports made to it under this act relative to the application and results of the tuberculin test, and in the month of January in each year to transmit to the State Live Stock Sanitary Commission a report on this subject, for the preceding calendar year, on blanks and in accordance with instructions received from the State Live Stock Sanitary Commission.

SEC. 6. Whoever shall violate any provision of this act or the written order of a local health officer, or of a local board of health made in accordance with this act, shall, on conviction, be deemed to be guilty of a misdemeanor, and be punished as in such case provided in the statutes.

GLANDERS IN MICHIGAN IN 1899.

During the year ending December 31, 1899, there were reported to this office four authenticated, and two suspected cases of glanders distributed as follows: Homer township, Midland county, one case in a horse; Chelsea village, Washtenaw county, one case in a horse; Briley township, Montmorency county, one suspected case in a horse; Bourret township, Gladwin county, one suspected case in a horse; Lake City village, Missaukee county, one case in a horse; Lake Ann village, Benzie county, one case in a horse.

The above-mentioned reported cases of glanders were all referred by the secretary of this Board, to the State Live Stock Commission.

In all of the above-mentioned instances, the health officials of the jurisdictions in which they occurred were informed that it was incumbent on their local boards of health, to protect the public from the disease by isolating affected animals until the cases were taken care of by the State Live Stock Commission, to which commission the existence of the disease should be reported and whose duty it is to act for their restriction.

ACTINOMYCOSIS (LUMP JAW) IN MICHIGAN IN 1899.

During the year 1899, actinomycosis was reported prevalent in four localities in Michigan, as follows: In Little Traverse township, Emmet county, in one cow; in Batavia township, Branch county, in one cow; in West Howell, Livingston county, in one cow; and in Watertown township, in one cow.

In all the above-mentioned instances, the health officials of the jurisdictions in which they occurred were informed that it was incumbent on their local boards of health, to protect the public from the disease by isolating affected animals until the cases were taken care of by the State Live Stock Commission, to which commission the existence of the disease should be reported and whose duty it is to act for their restriction.

ALLEGED RABIES (HYDROPHOBIA) IN MICHIGAN IN 1899.

No well defined case of rabies was reported in Michigan in 1899, though several instances were reported where dogs suspected of having rabies were seen, and bit other dogs and domestic animals. Even children were reported to have been bitten; but none of the cases are sufficiently well authenticated to merit special mention.

HOG CHOLERA BELIEVED TO HAVE AFFECTED CHILDREN.

The health officer of Mendon township wrote to the secretary of this Board relative to an outbreak of hog cholera in his jurisdiction as follows:

"In District No. 1, Mendon township, St. Joseph county, immediately around the school yard fence a large drove of hogs have been sick with cholera and many of them died.

"They were fed and watered immediately over fence from schoolhouse grounds. Some of them died near this fence.

"Some of the school children (five or six) have had bowel trouble and two cases among them have come down with typhoid fever.

"The owner shows no disposition to remove trough or turn over the ground.

"Please answer immediately for people of district are scared and I think something ought to be done."

On receipt of the above quoted letter the secretary communicated its contents to the owner of the hogs, who was supervisor of the township, and at the same time to the Hon. J. H. Brown, President of the State Live Stock Commission.

In reply to the secretary's letter the supervisor wrote:—

"There have been no hogs in field adjoining schoolhouse since last of September, and none sick in the drove since that date. The water from the schoolhouse well has been used by a family of five who live within ten rods of it, and they are all enjoying good health. There may be occasion for stringent measures, but I cannot see any reason for it. The hogs were never nearer than sixty feet of well; the water was carried to them. The well is a drive well forty to forty-five feet deep, twenty feet of pipe being driven in bottom of an open well; while the children first taken sick live side of a large marsh and get water from well at home fifteen to twenty feet deep and the father of them has twice before had typhoid fever.

"I am willing to do all I can to abate any nuisance but what to do in this case I do not know as it is quite a task to disinfect a whole school district."

The outbreak was investigated by the State Live Stock Commissioner with results as cited in the following letter from Mr. Brown:—

"Secretary Tyler and myself have just investigated the Mendon matter and informed the local board of health regarding their duties. The school is closed and I have ordered a thorough disinfection of the premises."

SUSPECTED MEAT POISONING.

The following letter relative to suspected meat poisoning, written by the secretary of this Board to Victor C. Vaughan, M. D., Director of the State Laboratory of Hygiene, Ann Arbor, relates the incidents bearing on this subject:

"By American Express, charges prepaid, I send you a one pound package of beef received from G. V. Wayland, M. D., Marcellus, Michigan, who writes to this office as follows:

"'I have sent you by express today one pound of pressed beef to be examined. As there have been several cases of sudden sickness here, and it seems as though all have partaken of this beef, we are quite anxious to know if it is not ptomain poisoning. I ask that you give it a thorough examination and write me verbatim report of the same.'

"I have written to Dr. Wayland that the sample of beef has been forwarded to you and that the examination will probably be made at a small cost, but he had better write to you immediately, stating to you whether or not he would bear the necessary expense of the examination.

"I shall be glad to have a report relative to the examination; for that purpose I enclose herewith a stamped envelope."

Doctor Vaughan's report of examination of the suspected beef is as follows:—

"I have received the sample of meat from G. V. Wayland, M. D., of Marcellus, and have written him. The injurious effects of the meat were undoubtedly due to putrefactive germs, which were very abundant. In fact, by the time the meat reached me, it was so thoroughly decomposed that there would be no hope of isolating a specific bacillus, were it present."

WHAT IS REASONABLE COMPENSATION OF A HEALTH OFFICER?

The village clerk of Alma, wrote to this office December 17, 1899, as follows:—

"We have a most excellent man and health officer in our Dr. ————, but our board are of the opinion that his services are costing too much ; for example, his charges :

For placarding a house	$1.00
For disinfecting a house	2.00
Final report on each case	1.00
Reporting diseases, each	.10

"Making each case cost the village a little over $4.00."

The letter closed asking advice. The secretary of this Board answered the inquiry as follows:

"* * * * If I have any criticism to make it is that his charges are too small. You state that you have a very excellent man and health officer which I am very glad to know. For obvious reasons the compensation of the health officer should be *greater* than he can obtain for the same time by the regular practice of his profession as a physician : the highest interests of the public demand that he shall have a greater money interest in the prevention of sickness, than either he or some other physician shall have in the treatment of sickness which should have been prevented. The law now requires more of the health officer than it formerly did, and provides for severe penalties if he neglects his duties. In the performance of those duties he may sometimes *sacrifice all the income from the practice of medicine;* accordingly his pay should be greater than formerly, and it should not only be adequate but certain, so that in each locality a good man will accept the important position of guardian of the public health."

ALLEGED CASCARET POISONING.

March 1, 1899, Mr. Felix Geutthoff wrote to this office stating that his wife and two children were taken ill from cascarets. He also sent tablets from the box of cascarets for analysis. March 2, 1899, Secretary Baker wrote to Mr. Geutthoff as follows:—

"This board has no laboratory ; it has no fund especially appropriated for the making of analyses. I will forward the cascarets and copy of your statement to Prof. V. C. Vaughan, Director of the State Laboratory of Hygiene at Ann Arbor, and express the hope that they may ascertain the nature of the poison.

"I notice that you gave a double dose, namely,*two* tablets to Mrs. Geutthoff, and a half tablet to each of the young children ; whereas the directions on the box say that *one* tablet is a dose for grown person and a quarter to a half a tablet for children. Your children being both under four years of age, should not, therefore, have taken more than a fourth of a tablet."

March 8, 1899, Secretary Baker wrote to V. C. Vauhgan, M. D., Director of State Laboratory of Hygiene, Ann Arbor, as follows:—

"By this mail I send you a box of 'cascarets,' alleged to have caused serious sickness in the family of Felix Geutthoff, Three Rivers, Michigan. Herewith I send you a copy of his statement. It would be interesting to know the cause of the poisoning ; therefore, thinking that you might wish to ascertain, I have sent the copy of the letter and the cascarets.

"From the fact that in all three of the instances a double dose of the cascarets was administered, I infer that the cause of the poisoning is the active principle, always made use of in making the tablets. If you determine what this is I shall be glad to be informed."

In reply to Secretary Baker's letter to Victor C. Vaughan, M. D., T. B. Cooley, Assistant in Hygiene of the U. of M., wrote to this office as follows:—

"Dr. Vaughan has handed to me for examination the box of cascarets mentioned in enclosed correspondence. Thinking that the symptoms described in Mr. Geutthoff's letter could hardly have come from anything likely to be contained in the tablets, I tried them on myself, and experienced no ill results whatever. Consequently it seems to me not worth while to attempt an elaborate and difficult analysis of the tablets. The symptoms described seem to me were more likely to have come from some form of food poisoning than from the medicine. I don't think there is any reason for believing that the cascarets contain anything of a poisonous nature, though of course a man might take enough of any such drug to make him quite ill."

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED BY THE USE OF KEROSENE, IN MICHIGAN, DURING THE YEAR ENDING DECEMBER 31, 1899.

Continuing a practice pursued in previous years, the office of the Secretary of the State Board of Health has, during the year 1899, sought to obtain information relative to each casualty, alleged to have been caused by the use of kerosene, which came to the notice of said office.

The principal sources from which this office obtains facts in regard to such casualties as above mentioned, are four, viz.: From reports by the fire marshal of Detroit, State inspectors and deputy inspectors of illuminating oils, local health officers, and from newspaper reports. Relative

TABLE 1.—*Casualties in Michigan during the year 1899, believed to have been consequent on the use of kerosene, information of which was received at the office of the Secretary of the State Board of Health. In this year the legal test was a flash test of 120° Fah., in a Foster automatic tester.**

	Number of casualties.	Number of localities.	Pecuniary losses, dollars.	Lives lost.	Persons injured (not fatally).
In Detroit	78	1	17,847	5	0
In State (outside Detroit)	70	41	350	10	1
Totals	148	42	18,197	15	1

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* In 1893, the legal test of kerosene, for illuminating purposes, was, by legislative enactment (Section 2, Act 94, Public Acts of 1893) made as follows: "It shall be the duty of the inspector and his deputies to provide themselves at their own expense with the necessary instruments and apparatus for testing the quality of said illuminating oils, and when called upon for that purpose to promptly inspect all oils hereinbefore mentioned, and to reject for illuminating purposes all oils which will emit a combustible vapor at a temperature of 120 degrees of Fahrenheit's thermometer: *Provided*, The quantity of oil used in the flash test shall not be less than half pint. The oil tester adopted shall be the Foster automatic tester cup, with the lighted wick placed inside the tube, and under the thimble which shall be used by the inspector and his deputies." Act 94 became operative July 1, 1893.

CASUALTIES FROM THE USE OF KEROSENE IN 1899 COMPARED WITH PREVIOUS YEARS.

TABLE 2.—*Exhibiting the number of casualties believed to have been consequent on the use of kerosene in Michigan (including the city of Detroit), information of which was received at the office of the Secretary of the State Board of Health in each of the eleven years, 1889-1899. The legal test of kerosene in each year is explained in the *foot-note to this table.*

Year.	Number of casualties.	Amount of damage done, dollars.	Number of lives lost.	Number of casualties caused by lamp explosions.	Number of casualties caused by stove explosions.
1889	53	†74,049	8	16	2
1890	55	18,282	2	22	6
First six months of 1891	‡30	10,778	2	19	2
Last six months of 1891	‡118	42,050	9	74	6
Total for the year 1891	148	52,828	11	93	8
1892	134	66,106	7	75	17
First six months of 1893	43	25,958	0	21	10
Last six months of 1893	40	23,542	2	22	5
Total for the year 1893	83	49,500	2	43	15
1894	64	20,374	9	29	1
1895	44	28,121	1	18	0
1896	59	17,756	3	33	1
1897	62	13,878	5	31	0
1898	61	27,918	1	31	1
1899	148	18,197	15	44	3

* In the years 1889, 1890, and the first half of 1891, the legal test was a flash test at 120 degrees Fah., in a closed tester; and in the last half of 1891, in 1892 and the first half of 1893, it was a burning test at 120 degrees Fah., in an open tester, which, because it varies greatly, is equal to a flash test of from 95 to 110 degrees Fah., probably averages about equal to a flash test of 100 degrees Fah., in a closed tester, like the one approved by the State Board of Health. The last half of 1893, and in 1894, 1895 and 1896 the legal test was a flash test at 120 degrees Fah., in the Foster automatic tester, which has not been approved by the State Board of Health.

† The total reported damage ($74,049) for 1889 includes $40,000 damage caused by a single fire at 678 Jefferson avenue, Detroit. The fire was caused by a careless manipulation of an oil heater used for heating a conservatory, and "was not the result of the grade of the oil used."

‡ Included in these numbers are data relative to twenty-seven reported casualties in 1891, of which the exact dates of occurrence were not reported. In order to make an equitable distribution of these between the first and last halves of the year a proportionate division of them is made, based on the data contained in Table 2 of this article, thus: Table 2 shows that *exclusive* of the above-mentioned twenty-seven casualties, there were reported 121 casualties in the State, in 1891; that twenty-four (about 20 per cent) of these occurred in the first half of the year, and ninety-seven (about 80 per cent) occurred in the last half of the year. The twenty-seven casualties, the dates of which are not given, are divided between the first and last halves of the year in the same proportion, that is 20 per cent of them are added to the first half, and 80 per cent to the last half of the year.

to the last of these sources of information it should be stated that the secretary of this Board does not accept as necessarily authentic, newspaper reports of casualties from the use of kerosene. When such reports come to his knowledge, he applies to the proper officials of the localities in which they are said to have occurred, for confirmation or contradiction of the reports, and for any information which these officials may be able to give in connection with the alleged casualties. A copy of the form of letter used on such occasions, is given in the annual report of this Board for the year 1892, page 334. The data collected from these sources show that during the year 1899, information was received at this office of the occurrence of 148 casualties consequent on the use of kerosene in Michigan. The casualties were reported to have occurred in forty-two localities, causing loss of 15 lives and damage of property to the amount of $18,197.

This reported damage does not include all the actual pecuniary loss occasioned by the above-mentioned casualties, because in some instances where houses, barns and other property were destroyed the loss was not reported.

TABLE 3.—*Exhibiting the number of casualties believed to have been consequent on the use of kerosene in Detroit during each of the years 1889-1899. (Reported by the fire marshal of Detroit to the office of the State Board of Health.) The legal test of kerosene in each year is explained in the *foot-note to Table 2 of this article.*

Year.	Number of casualties.	Amount of damage done, dollars.	Number of lives lost.	Number of casualties caused by lamp explosions.	Number of casualties caused by stove explosions.
1889	35	*65,250	3	14	2
1890	44	18,282	0	15	6
First six months of 1891	14	2,878	0	9	2
Last six months of 1891	41	9,760	2	26	5
Total for year 1891	55	12,638	2	35	7
1892	79	39,306	2	37	13
First six months of 1893	37	20,958	0	19	10
Last six months of 1893	34	18,536	0	19	5
Total for year 1893	71	39,494	0	38	15
1894	55	18,844	3	28	1
1895	42	27,471	0	17	0
1896	47	17,266	0	26	0
1897	43	11,678	2	20	0
1898	53	25,868	0	30	0
1899	78	17,847	5	22	1

* The total reported damage for 1889 includes $40,000 damage caused by a single fire at 678 Jefferson avenue. The fire was caused by careless manipulation of an oil heater used for heating a conservatory, and "was not the result of the grade of the oil used."

The large increase in deaths which occurred from the use of kerosene in 1899 as compared with 1898, and previous years, is explainable as follows: (1) From Detroit there were five deaths reported in 1899 which was an increase of five over 1898; and two more than in any year since the law changing the test went into operation in 1893. (2) In the State, outside of Detroit, in 1899 there were ten deaths reported, which was nine more than in 1898, and three more than in any year since 1893. Four of these deaths were reported on annual reports of health officers, an unusual source of such information, and two were reported as having occurred in one casualty, a fire in Traverse City.

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED BY THE USE OF GASOLINE IN MICHIGAN IN 1899.

In 1899, as in former years, an effort was made, at the office of the Secretary of the State Board of Health, to collect facts respecting every casualty attributed to the use of gasoline, in Michigan, which came to notice. During the year there were received at the office of the Secretary of the Board reports of one hundred and sixty-four casualties in twenty-one different parts of the State alleged to have been caused by gasoline, with attendant losses of life and property, and personal injury as follows: Ten persons fatally, and five persons more or less severely injured; damage to property to the amount of $20,706.

TABLE 1.—*Casualties in Michigan during the year 1899, believed to have been consequent on the use of gasoline, information of which was received at the office of the Secretary of the State Board of Health.*

	Number of casualties.	Number of localities.	Pecuniary losses, dollars.	Lives lost.	Persons injured (not fatally).
In Detroit..........................	124	1	20,656	4	0
In State (outside Detroit).........	40	20	50	6	5
Totals in Michigan.............	164	21	20,706	10	5

Of the one hundred and twenty-four reported casualties from the use of gasoline in Detroit during the year, two were attributed to stove explosions, ninety-six were attributed to leaking or overflowing stoves, and twenty-six to carelessness in handling gasoline, and other causes.

The source of danger in the use of gasoline.—The special source of danger in the use of gasoline is its ready vaporization at low temperatures. When exposed to the air, gasoline evaporates quickly, its vapor mixes with the air, and therewith forms an explosive mixture which readily ignites when it comes in contact with a flame or other sufficient cause. This property of gasoline renders it more dangerous than is gunpowder. Some of the casualties reported were undoubtedly the result of ignorance, or disregard, of these facts.

ALLEGED NUISANCES IN MICHIGAN IN 1899.

During the year 1899, communications relative to eighty-nine alleged nuisances, in Michigan, were received at the office of the State Board of Health.

The causes to which the alleged nuisances mentioned in these communications were attributed, may be classified as follows:

Water closets, privy vaults, cesspools and alleys, 14; barns, barnyards and outhouses, 11; waste dumped on ground, in lakes and ponds, 10; slaughtering, slaughter-houses and meat markets, 10; drains and open ditches, 7; contaminated water, 5; sewerage, 4; stagnant ponds and swamps, 4; insufficiently buried animals, 3; hogs and hog cholera, 3; manure pile and fertilizer, 2; unsanitary conditions of premises and cities, 2; pomace from cider mills, 2; dams and fish shute, 2; dead animals thrown in stream, 1; flooding of Littlefield Lake, 1; consumptive in jail, 1; canning factory, 1; Smead system, 1; tannery, 1; and emery dust from stove works, 1.

Whenever complaint of an alleged nuisance is received at this office, the president of the local board of health whose duty it is to act, is usually informed of the nature of the nuisance, and is requested to investigate the same. At the same time sections of law, and pamphlet publications of this Board, pertaining to nuisances and to the duties of local boards of health relative thereto, are sent to him, and also to the person making complaint. Two regular forms of letters are used for this purpose, copies of which are here given. The first is sent to the person making complaint of the nuisance, the other is sent to the president of the board of health of the locality where the nuisance is reported to exist.

STATE BOARD OF HEALTH, MICHIGAN.
OFFICE OF THE SECRETARY,
Lansing,

Section 1640, Howell's Statutes, requires the local board of health to examine into all nuisances, sources of filth, and causes of sickness which may, in their opinion, be injurious to the health of the inhabitants, and destroy, remove, or prevent the same as the case may require.

Section 7965, Howell's Statutes, gives the circuit court *equity* jurisdiction in all matters concerning nuisances where there is not a *plain, adequate* and *complete* remedy at law; and authorizes the court to grant injunctions to stay or prevent nuisances. If the court is not in session, application should be made to the circuit judge.

If the local board of health refuses or neglects to make the proper complaint for the abatement of a nuisance injurious to health, any person injured or annoyed thereby may make complaint and prosecute a suit for the abatement of the nuisance as a public nuisance, or for damages by reason of the nuisance as a private nuisance, and for the abatement of the same.

Herewith I send you our pamphlet, "Work of Health Officers and Local Boards of Health in Michigan," on pages 10 and 11 of which are paragraphs bearing on the subject of nuisances, and I send you also some other pamphlet publications of this office bearing on the same subject.

I have not asked the attention of the president of the local board of health to this subject. If this office can be of any further service to you in this case, it will give me pleasure.

Herewith I enclose a stamped envelope, and after reasonable time I shall be glad to learn what is done to abate the alleged nuisance, and with what result.

Very respectfully,

Secretary.

O

STATE BOARD OF HEALTH, MICHIGAN.
OFFICE OF THE SECRETARY,
Lansing,

President of the Board of Health:

Section 1640, Howell's Statutes, requires the local board of health to examine into all nuisances, sources of filth, and causes of sickness that may, in their opinion, be injurious to the health of the inhabitants, and destroy, remove, or prevent the same as the case may require.

Section 7965, Howell's Statutes, gives the circuit court *equity* jurisdiction in all matters concerning nuisances where there is not a *plain*, *adequate*, and *complete* remedy at law; and authorizes the court to grant injunctions to stay or prevent nuisances. If the court is not in session, application should be made to the circuit judge.

Herewith I send you our pamphlet, "Work of Health Officers and Local Boards of Health in Michigan," on pages 9 and 10 of which are paragraphs bearing on the subject of nuisances, and some other pamphlet publications of this office bearing on the same subject.

I shall be glad to be informed whether or not, on examination, this alleged nuisance proves to be a nuisance, and, if it is, what measures are taken for its removal or abatement, and with what result. For this purpose a stamped envelope is herewith enclosed.

Very respectfully,
Secretary.

In articles on alleged nuisances, published in previous annual reports of this Board, attention was called to the fact that a large proportion of the communications received at this office in regard to alleged nuisances came from local health officers and other township, city and village officials, asking for information relative to points of law concerning nuisances, or requesting advice as to their duties, or to the proper legal procedure necessary to effect the prevention or abatement of nuisances. The correspondence of 1899, shows a desire on the part of the local health officials for advice and co-operation of this Board, which has been freely and cheerfully given, and it is believed, with beneficial results to the public health.

The State Board of Health has no authority to enforce or order the abatement of a nuisance. Its powers in this respect are advisory. And while the Board is willing to render such advice as it may be able to give on any subject, it is often the case in regard to nuisances that prosecuting attorneys, or other lawyers, on the ground and acquainted with the facts, are in better position to give legal advice than is the State Board of Health. The State Board of Health is always glad to learn of the efforts of local boards to abate nuisances, and what success attends those efforts; and solicits correspondence upon this subject. It cannot, however, undertake to do for local boards that which the law has so well provided for their doing for themselves. In showing them how they can help themselves it really does more for them than to do their work; for when the local board has mastered the situation and removed a nuisance, it has secured a vantage ground which a distant authority could not so well secure and hold.

INDEX.—REPORT FOR 1900.

[In this index, unless otherwise stated, the localities mentioned are in Michigan.]

Page.

Actinomycosis (lump-jaw) in Michigan in 1899.... 247
Agricultural College, meteorological conditions at, 1899.... 3–57
    atmospheric pressure 54–55
    average temperature at.... 3, 4
    cloudiness 28, 29
    latitude, longitude, altitude, atmospheric pressure at.... 3
    rainfall 32
    temperature 12–14, 16–18
  meteorological observer at, 1899.... 2
Ainge, T. S., meteorological observer, State Board of Health, Lansing.... 2
Alma, meteorological conditions at, 1899.... 3–57
    atmospheric pressure 52–54
    cloudiness 28, 29
    humidity 22–25
    latitude, longitude, altitude, atmospheric pressure, at.... 3
    ozone 34–37
    sunshine and clouds.... 57
    temperature 12, 13, 16–18
    wind, direction of.... 46–51
  meteorological observer at, 1899.... 2
  meteorological phenomena at.... 7
  special meeting of State Board of Health at.... xii
Alpena, meteorological conditions at, 1899.... 3–57
    latitude, longitude, altitude, atmospheric pressure, at.... 3
    rainfall 32
    sunshine and clouds.... 57
    temperature 16–18
    wind, direction, velocity, etc.... 42, 43
  meteorological observer at, 1899.... 2
  meteorological phenomena at.... 9
Altitude of meteorological stations in Michigan, Exhibit 2.... 3
Animals, diseases of, dangerous to man.... 244–248
Ann Arbor, meteorological conditions at, 1899.... 3–57
    atmospheric pressure 52–55
    cloudiness 28, 29
    humidity 22–25
    latitude, longitude, altitude, atmospheric pressure, at.... 3
    ozone 34–37
    rainfall 32, 33
    sunshine and clouds.... 57
    temperature 12, 13, 16–19
    water in well, depth, temperature, etc.... 10
    wind, velocity, direction, etc.... 42, 43, 46–51
  meteorological observer at, 1899.... 2
  meteorological phenomena at.... 9
Annual reports (indexed reports).
Annual Report of Secretary of State Board of Health, law relative to preparation of. vi
    printing and distribution of.... xvi
    required by law.... v, vi
Atmosphere, temperature of.... 11–20
Atmospheric pressure, average, by months, at groups of stations, for 1899, 1898 and 1877-98, compared, Exhibit 27.... 53
  average by year and months, 1899, at certain stations, Table XVII, Diagram XVI.... 54–55
  average daily range at certain stations, Table XV.... 52
  average daily range, 1899, 1898 and 1882-98, compared, Exhibit 28 56
  range by year and months, 1899, and average line at 8 stations, Table XVI 53
  range by year and months, 1899, 1898 and 1882-98, compared, Exhibit 29 56
Auroras, in Michigan in 1899.... 30
Average temperature (indexed temperature).

Page.

- **Bacteriological** examination of sputa of alleged consumptives 217
- Baker, M. D., Henry B., Secretary of State Board of Health vii
  - extracts from papers on meningitis, and tables and diagrams illustrating same 235–242
- Baldwin, H. McP., meteorological observer at Alpena 2
- Barometric pressure, average, at meteorological stations in Michigan, Exhibit 2 3
- Battle Creek, meteorological conditions at, 1899 3–57
  - atmospheric pressure 52–55
  - cloudiness 28, 29
  - humidity 22–25
  - latitude, longitude, altitude, atmospheric pressure, at 3
  - ozone 34–37
  - rainfall 32
  - smallpox in 194
  - sunshine and clouds 57
  - temperature 12, 13, 16–18
  - water in well, depth, temperature, etc 10
  - wind, direction of 46–51
  - meteorological observer at, 1899 2
- Belknap, M. D., Fred R., member of State Board of Health vii
- Benton Harbor city, smallpox in 192, 193
- Benton township, smallpox in 193
- Birmingham, meteorological conditions at, 1899 3–57
  - atmospheric pressure 52–54
  - cloudiness 28, 29
  - humidity 22–25
  - latitude, longitude, altitude, atmospheric pressure at 3
  - ozone 34–37
  - rainfall 32, 33
  - temperature 12, 13, 16–19
  - wind, direction of 46–51
  - meteorological observer at, 1899 2
- Board of Health, State, abstracts of quarterly report of work in office xxiv–xxvii
  - change of site for observations for ozone 38
  - collection and compilation of information in office of xii–xv
  - expenditures of, fiscal year 1900 xxiii
  - meetings, regular and special xi, xii
  - meteorological conditions at office of 3–57
    - atmospheric pressure 52–55
    - auroras 30
    - cloudiness 28, 29
    - humidity 22–25
    - latitude, longitude, altitude, atmospheric pressure 3
    - ozone 34–37
    - rainfall 32, 33
    - sunshine and clouds 57
    - temperature 3, 4, 12–20
    - water in well, depth, temperature, etc 10, 165, 166
    - wind, direction, velocity, etc 39–43, 46–51
  - meteorological observers at office of 2
  - meteorological phenomena at office of 7–9
  - names and addresses of members of vii
  - regular, and special meetings at Lansing xi, xii
  - standing committees of vii
  - work in office of secretary, fiscal year 1900 xii–xx
  - work of, during fiscal year 1900 vii–xii
  - publication of proceedings of meetings of xix, xx
- Bowels, inflammation of, as a cause of sickness, illustrated by a diagram 98
  - as a comparative cause of sickness 86, 90, 98
  - per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
  - per cent of reports stating presence of, 1886-99 and period of years, Exhibit I 63–65
  - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
- Bozzell, C. L., meteorological observer at Sault Ste. Marie 2
- Brain, inflammation of, as a cause of sickness illustrated by a diagram 98
  - as a comparative cause of sickness 86, 90, 98
  - per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
  - per cent of reports stating presence of, 1886-99 and periods of years, Exhibit I 63–65
  - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
- Brant township, smallpox in 195, 196
- Bronchitis, as a cause of sickness, illustrated by a diagram 70
  - as a comparative cause of sickness 86, 89, 90, 91
  - by year and months in 1899 and meteorological conditions, Exhibit VII 95
  - per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
  - per cent of reports stating presence of, in 1889-99 and periods of years, Exhibit I 63–65
  - relation of, to meteorological conditions 93–97, 102

Page.

Bronchitis, sickness from, in 1899 compared with previous years and periods of years, Exhibit VI 94
  summary of weekly reports, prevalence as regards time and area, Tables 2 and 4 74–85
Buildings, State, examination of plans for, and list of lx–xi
Bulletins of Health in Michigan 60, 61
  of Vital Statistics issued by State Department, use of, in office xxv
  Teachers' Sanitary, issuing of, by State Board of Health xvi, xvii

Cancer in Michigan 242
Card reports, weekly, plan of 59, 60
Carrollton township, smallpox in 196
Cascaret poisoning, alleged, in Michigan in 1899 249, 250
Caulkins, M. D., John S., meteorological observer at Thornville 2
Cerebro-spinal meningitis (indexed meningitis).
Clerks of boards of health, reports from, discontinued xxiii
Climate and sickness 93–104
Cloudiness, average by year and months in 1899, 1898 and 1877-98, compared, for groups of stations, Exhibit 18 30
  per cent by year and months, 1899, and average line for several stations, Table VI, Diagram VI 28, 29
Clouds, days when observed at stations in Michigan 57
Chase township, smallpox in 195
Chesaning township, smallpox in 196
Chicken-pox (varicella) in Michigan in 1899 199
Cholera infantum, as a cause of sickness, illustrated by a diagram 70
  as a comparative cause of sickness 86, 90, 91
  per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
  per cent of reports stating presence of, 1889-99, and periods of years, Exhibit I 63–65
  relation of, to certain meteorological conditions 99, 100, 103
  summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
Cholera morbus, as a comparative cause of sickness 86, 89, 90, 91
  as a cause of sickness, illustrated by a diagram 70
  per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
  per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
  relation of, to meteorological conditions 99, 100, 103
  summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
"Cold weather diseases," relation of, to meteorological conditions 93–98, 102
Coloma village, smallpox in 193
Committees, standing, of State Board of Health vii
Communicable diseases, (indexed diseases, communicable).
Compilation of weekly reports 61
Conger, Norman B., meteorological observer at Detroit 2
Conklin, meteorological conditions at 3–57
  auroras 30
  cloudiness 28
  humidity 22–25
  latitude, longitude, altitude, atmospheric pressure 3
  ozone 34, 36
  sunshine and clouds 57
  temperature 12, 13, 16–19
  water in well, depth, temperature, etc 10
  wind, direction 46–51
  meteorological observer at, 1899 2
  meteorological phenomena at 7, 8
Consumption, ages of greatest prevalence of and mortality from 206, 208
  and meteorological conditions 93, 94, 102
  as a cause of sickness illustrated by a diagram 98
  as a comparative cause of sickness 86, 89, 90, 91
  distribution of, by counties 204
  duration of sickness from 208, 209
  how disease begun 216
  how most commonly spread 206
  information contained in final reports of cases of 217
  in 1899 compared with previous years 98, 201–203
  instances of infection from different sources 218
  in Michigan in 1899 201–218
  location of disease 211
  methods of disinfection in cases of 215, 216
  number and per cent of newspaper and other reports of xxv, 108
  number of consumptive relatives and associates of cases of 212, 213
  number of deaths by months in 1899 and average for years, 1894-98 206
  number of localities at which present each week in 1899, Table 1 106
  per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
  per cent of reports stating presence of, in 1889-99 and periods of years, Exhibit I 63–65

Page.

Consumption, results of bacteriological examinations of sputa in cases of 217
sex, age and duration of non-fatal cases, 1894-99 210
sickness and death-rates from 203–205
source of contagium of 206
summary of weekly reports, prevalence as regards time and area, Tables 2 and 4 74–85
Consumptives, nationalities of 217
occupation of 214
Convention, sanitary vii, viii
Croup, membranous, and meteorological conditions 93, 96–102
as a cause of sickness illustrated by a diagram 87
as a comparative cause of sickness 86, 87, 91
per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
per cent of reports stating prevalence of, in 1889-99 and periods of years, Exhibit I 63–65
summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85

Delray village, smallpox in 198
Detroit, kerosene and gasoline casualties in 250–253
meteorological conditions at, 1899 3–57
latitude, longitude, altitude, atmospheric pressure, at 3
rainfall 32
sunshine and clouds 57
temperature 16–18
wind, velocity, direction, etc 42, 43
meteorological observer at, 1899 2
meteorological phenomena at 8, 9
smallpox in 198, 199
Diagram, I, average temperature by months, 1899 13
II, average daily range of temperature, by months, 1899 19
III, absolute humidity by months, 1899 23
IV, relative humidity, by months, 1899 25
V, number of observations of fogs in each month of 1899 27
VI, average per cent of cloudiness by months, in 1899 29
VII, rainfall, by months, 1899 33
VIII, ozone, day, by months in 1899 35
IX, ozone, night, by months in 1899 37
X, velocity of wind, by hours and months, 1899, at Lansing 41
XI, velocity of wind, by months, 1899 43
XII, wind, direction of, by months, at stations, 1899 51
XIII, wind, direction in Michigan, average 12 years, 1878-89 45
XIV, wind, direction in Michigan, year and months, 1899 45
XV, wind, direction in Michigan, 1899 46
XVI, atmospheric pressure by months, 1899 55
1, 2, 3, 4, 5, weekly reports of sickness in Michigan 70, 87, 97, 98, 101
isolation and disinfection restricted diphtheria in 1899 117
isolation and disinfection restricted scarlet fever in 1899 138
isolation and disinfection restricted typhoid fever in 1899 159
Diagrams, deaths from meningitis, and atmospheric temperature 237–240
of instructive experience in Michigan xvii, xviii
Diarrhea and meteorological conditions 99–101, 103
as a cause of sickness, illustrated by a diagram 70
as a comparative cause of sickness 86, 89, 90, 91
per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
relation of, to certain meteorological conditions 99, 100, 103
summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
Diphtheria and meteorological conditions 93, 96, 102
as a cause of sickness, illustrated by a diagram 87
as a comparative cause of sickness 86, 87, 90, 91
average age 119, 120
cases prevented and lives saved by isolation and disinfection 114–117
cases taken sick and present, and localities infected by months 113, 114
cases traced to preceding cases 114
contagium conveyed by cats 121
contagium supposed to be from wall paper, silver coin, etc 122
death-rates from 111, 112
distribution of, by counties, in 1899 111, 112
duration of sickness from 120, 121
fatality from 112
in age-groups, cases and deaths, Tables 8, 9, 10 and 11 118–120
in cities, villages and townships 112
in each month of the year, 1899 113
in 1899 compared with previous years 110
in Michigan in 1899 110–122
malignant case traced to a light case 122
number and per cent of newspaper and other reports of xxv, 108
number of cases and deaths, number per 10,000 population, 1899, Table 1. 111

Page.
Diphtheria, number of localities at which present each week in 1899, Table 1....... 106
outbreaks of, which began, ended and were present each month, 1899.... 113
per cent of observers reporting presence of in 1889-99 and periods of years, Table 1 71-73
per cent of reports stating presence of, in 1886-99 and periods of years, Exhibit I 63-65
period of incubation 118
sickness-rates from 111, 112
source of contagium, how the disease is spread.............. 114, 121, 122
summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74-85
Disease, average, and meteorological conditions.............. 93-96, 102
and total sickness.............. 101, 104
in 1899 compared with 1898 and periods of years, Exhibit XIII.............. 104
time of greatest prevalence of each.............. 58-104
Diseases, communicable, in Michigan in 1899.............. xxiv, xxv, 105-243
compilation of information relative to, purposes of.............. 107
distribution of information how to restrict and prevent.............. xv
immigrants possibly exposed to.............. xix
number and per cent of newspaper and other reports of.............. xxv
number of localities at which present each week in 1899.............. 106
number of reports and communications received and filed.............. xxiv, xxv, 107-109
special reports relative to.............. xiii, xiv
system of reporting, blanks used, etc.............. 105
in animals dangerous to man.............. 244-248
increase or decrease in prevalence of certain, in 1899.............. 62
method of comparison by years, months and weeks.............. 62
names of observers, localities, number of reports, by State divisions, Exhibit II 66-69
order of prevalence, 1887-99, for each of the 28, Exhibit A.............. 86
order of prevalence, illustrated by diagrams.............. 70, 87, 97, 98, 101
per cent of observers reporting presence of each of the 28 in 1889-99 and averages for periods of years, Table 1.............. 71-73
per cent of reports stating prevalence of the 28, in 1889-99 and periods of years, Exhibit I.............. 63-65
relation of, to meteorological conditions.............. 93-104
summary of prevalence of, as regards time and area, by State divisions, Tables 2 and 4.............. 74-85
which caused most sickness, order of prevalence, etc.............. 70-101
Disinfection and isolation (see isolation and disinfection).
Dysentery, as a cause of sickness, illustrated by a diagram.............. 70
as a comparative cause of sickness.............. 86, 89, 90, 91
per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1.............. 71-73
relation of, to meteorological conditions.............. 99, 100, 103
per cent of reports stating presence of, in 1886-99, and periods of years, Exhibit 1 63-65
summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74-85

Erysipelas as a cause of sickness, illustrated by a diagram.............. 97
as a comparative cause of sickness.............. 86
in Michigan in 1899.............. 243
per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1.............. 71-73
per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit 1 63-65
summary of weekly reports, prevalence of, as regards time and area, Tables 2 and 4.............. 74-85
Exhibit I, per cent of reports stating presence of each of 28 diseases in each year, 1889-99, and averages for periods of years.............. 63-65
II, names of observers whose weekly reports of diseases for 1899 are compiled in Tables 1, 2, 3 and 4.............. 66-69
III, diseases from which there seems to have been the most sickness in Michigan in 1899 89
IV, by State divisions the 15 diseases from which there seems to have been the most sickness in 1899.............. 90, 91
V, certain meteorological conditions in Michigan in 1899, compared with preceding years 92
VI, sickness from bronchitis, by year and months in each of years 1877-99 and average for 1877-98, and 1889-98.............. 94
VII, bronchitis and meteorological conditions by year and months, 1899.... 95
VIII, per cent of reports of certain diseases, by months, in 1899, compared with 1898, and with average for certain year groups.............. 96
IX, sickness from consumption, by year and months in 1899, compared with averages for two periods of years.............. 98
X, per cent of reports of certain diseases, by year and months, 1899, compared with 1898, and with averages for 1877-98, and 1889-98.............. 100
XI, summary relative to prevalence of cold weather diseases, and climatic conditions 102
XII, summary relative to prevalence of warm weather diseases, and climatic conditions 103

Page.

Exhibit XIII, sickness from average disease, by year and months, 1899, compared with 1898, and average in two periods of years.................... 104
 A, order of prevalence of 28 diseases, in each of the years, 1887–99........ 86
 B, stating for each of years 1889-99, the number of card reports received and average number of diseases on each report...................... 88
 1, names of observers, meteorological, places of observation.............. 2
 2, latitude, longitude, altitude, average temperature and atmospheric pressure at stations in Michigan in 1899...................................... 3
 3, average temperature by year and months for 1899, and average for the 22 years, 1877-98, at stations in Michigan.................................. 4
 4, average temperature by year and months for 1899, and average for 20 years, 1879-98, at State Board of Health office, Lansing................ 4
 5, average temperature by year and months for 1899, and average for 35 years, 1864-98, at Agricultural College................................ 4
 6, meteorological conditions by year and months, in 1899, compared with averages for 1898 and for periods of years, at groups of stations........ 5–6
 7, depth and temperature of water in wells at certain stations in Michigan in 1899.. 10
 8, average temperature by year and months in 1899, compared with averages for 1898, and 22 years, 1877-98, at stations in Michigan............ 11
 9, temperature, average by year and months in 1899, compared with 1898 and the averages for 35 years, 1864-98, at Agricultural College........ 14
 10, temperature, average, by year and months in 1899, compared with 1898 and the 20 years, 1879-98, at Lansing............................. 14
 11, average temperature, by year and months, 1899, at State Board of Health office, Lansing.. 15
 12, average daily range of temperature, by year and months, for 1899, compared with 1898, and averages for 20 years, 1879-98, at stations in Michigan.. 15
 13, extremes and range of temperature, by months, 1899, compared with average for 1877-98, also statement of, for 1893-99, at stations in Michigan.. 20
 14, average absolute humidity, by year and months, 1899, compared with averages for 1898 and 1877-98, at stations in Michigan................ 21
 15, average relative humidity, by year and months, for 1899, compared with average for 1898 and for 21 years, 1878-98, at stations in Michigan...... 21
 16, foggy days in Michigan, by months, in 1899.......................... 26
 17, number of observations of fog in each month of 1899................. 26
 18, cloudiness, average per cent of, by year and months, 1899, compared with 1898, and average for 22 years, 1877-98............................ 30
 19, auroras observed and recorded at stations in Michigan, in 1899........ 30
 20, solar and lunar halos, dates when recorded, in 1899.................. 31
 21, rainfall, average, by year and months, 1899, compared with 1898, and with averages for 22 years, 1877-98, at stations in Michigan............. 31
 22, ozone, day, by months, for 1899, compared with 1898, and with averages for 22 years, 1877-98, at stations in Michigan.................... 38
 23, ozone, night, by months for 1899, compared with 1898, and with averages for 22 years, 1877-98, at stations in Michigan.................. 38
 24, velocity of wind, by months, in 1899, compared with 1898, and with averages for 17 years, 1882-98, at stations in Michigan................ 39
 25, velocity of wind, by months in 1899, compared with 1898, and with averages for years, 1880-98, at Lansing............................... 39
 26, direction of wind, by months, 1878-89.............................. 44
 27, average atmospheric pressure, by months, in 1899, compared with 1898, and averages for 22 years, 1877-98, at stations in Michigan............ 53
 28, range of atmospheric pressure, by months in 1899, compared with 1898, and with averages for 17 years, 1882-98, at stations in Michigan........ 56
 29, range of atmospheric pressure, by months, in 1899, compared with 1898, and with averages for 17 years, 1882-98, at stations in Michigan........ 56
 30, sunny and cloudy days reported in 1899.............................. 57
 1, scarlet fever in 1899 compared with previous years.................. 123
 2, scarlet fever, movement of contagium of.............................. 128–136
Expenditures by State Board of Health, fiscal year 1900...................... xxiii

Fall, M. S., Delos, member of State Board of Health...................... vii
Farmers' institutes.. viii, ix
Felger, George W., meteorological observer at Grand Haven.................. 2
Flint, special meeting of State Board of Health at........................... xi
Fog in Michigan in 1899... 26, 27
Force, William M., meteorological observer, State Board of Health, Lansing........ 2

Gasoline, casualties caused by the use of.................................. 253
Gates, M. D., W. C., meteorological observer at Rockland...................... 2
Geographical divisions of State, names of observers reporting sickness from, Exhibit II.. 66–69
German measles (rötheln) in Michigan in 1899................................. 143
Glanders in Michigan in 1899.. 246, 247
Grand Haven, meteorological conditions at, 1899.............................. 3–57
  latitude, longitude, altitude, atmospheric pressure, at.......... 3
  ozone.. 34–36
  rainfall... 32, 33
  sunshine and clouds.. 57
  temperature.. 16–19
  wind, velocity, direction, etc... 42, 43
 meteorological observer at, 1899... 2

Page.
Grand Rapids city, smallpox in.... 195
  special meetings of State Board of Health at.... xii
Grant, R. Q., meteorological observer at Port Huron.... 2
Ground water (see water).

Hall, Jr., Asaph, meteorological observer at Ann Arbor.... 2
Harrison, John A., meteorological observer at Conklin.... 2
Harrisville, meteorological conditions at, 1899.... 3–57
  atmospheric pressure.... 52–55
  cloudiness.... 28, 29
  humidity.... 22–25
  latitude, longitude, altitude, atmospheric pressure at.... 3
  ozone.... 34–37
  rainfall.... 32, 33
  temperature.... 12, 13, 16–19
  wind, direction of.... 46–51
  meteorological observer at, 1899.... 2
Halos, solar and lunar, in Michigan in 1899.... 31
Health and weather in 1900 compared with 1899.... xxvii
Health bulletins in Michigan.... 60, 61
Health laws (indexed laws).
Health officer, what is reasonable compensation for.... 249
Health officers, blanks sent to, for making annual reports.... xiv
  instructions to, by telephone, telegraph, etc.... xvii
  instructions to newly appointed.... xvi
  return of names and addresses, and published list of.... xii, xiii, xv
Health officials, conference of.... viii
Hog cholera believed to have affected children.... 247, 248
Humidity, absolute, average by months, 1899, and average line for several stations, Table IV, Diagram III.... 22–23
  absolute, 1899, 1898 and 1877-98, compared (groups of stations), Exhibit 14.... 21
  relative, average by months, 1899 and average line for several stations, Table V, Diagram IV.... 24, 25
  relative, 1899, 1898 and 1878-98, compared (groups of stations), Exhibit 15.... 21
Hydrophobia (rabies) in Michigan in 1899.... 247

Immigrants, possibly exposed to communicable diseases.... xix
Introduction to report for 1900.... v
Influenza as a cause of sickness, illustrated by diagram.... 87
  as a comparative cause of sickness.... 86, 89, 90, 91
  compared with certain meteorological conditions.... 93–97, 102
  per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1.... 71–73
  per cent of reports stating presence of, 1889-99, and periods of years, Exhibit I.... 63–65
  summary of weekly reports, prevalence of, as regards time and area, Tables 2 and 4.... 74–85
Intermittent fever as a cause of sickness, illustrated by a diagram.... 101
  as a comparative cause of sickness.... 86, 89, 90, 91
  per cent of observers reporting presence of in 1889-99 and periods of years, Table 1.... 71–73
  per cent of reports stating presence of, 1889-99, and periods of years, Exhibit I.... 63–65
  relation of to meteorological conditions.... 99, 100, 103
  summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4.... 74–85
Isolation and disinfection, result of, in diphtheria.... 137–139
  in measles.... 173–175
  in scarlet fever.... 137–139
  in typhoid fever.... 158–161
  in whooping-cough.... 185–186

Johnston, M. D., Collins H., member of State Board of Health.... vii

Kalamazoo, smallpox in.... 195
  special meeting of State Board of Health at.... xi
Kedzie, Prof. R. C., meteorological observer at Agricultural College.... 2
Kellogg, M. D., J. H., meteorological observer at Battle Creek.... 2
Kerosene, casualties caused by the use of, in Michigan.... 250–253
Kidney, inflammation of, as a cause of sickness, illustrated by a diagram.... 97
  as a comparative cause of sickness.... 86, 89, 90, 91
  per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1.... 71–73
  per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I.... 63–65
  summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4.... 74–85

Lansing, (indexed Board of Health, State), (indexed also Agricultural College).
Lansing, State Board of Health office at (indexed, Board of Health, State).

Page.
Lapeer, special meetings of State Board of Health at ... xi, xii
Latitude of meteorological stations in Michigan, Exhibit 2 ... 3
Law, relative to preparation and publication of annual report of State Board of Health ... v, vi
Laws, compilation of, relative to public health in Michigan ... xv
Longitude of meteorological stations in Michigan, Exhibit 2 ... 3
Lump-jaw (actinomycosis) in Michigan in 1899 ... 247

MacLachlan, M. D., D. A., member of State Board of Health ... vii
Map, distribution of consumption by counties, 1899 ... 205
Maple Grove township, State investigation of outbreak of smallpox in ... 196, 197
Marquette, meteorological conditions at, 1899 ... 3–57
auroras ... 30
latitude, longitude, altitude, atmospheric pressure at ... 3
rainfall ... 32, 33
sunshine and clouds ... 57
temperature ... 16–19
wind, velocity, direction, etc ... 42, 43
meteorological observer at, 1899 ... 2
meteorological phenomena at ... 7–9
Marine City, smallpox in ... 198
Masonville, smallpox in ... 193, 194
McAlvay, Hon. Aaron V., member of State Board of Health ... vii
Measles, ages of greatest prevalence of, and mortality from ... 176–178
and meteorological conditions ... 99, 100, 103
as a cause of sickness illustrated by a diagram ... 97
as a comparative cause of sickness ... 86, 89, 90, 91
case-mortality rates, at different ages ... 178
cases prevented, and lives saved by isolation and disinfection ... 173–175
death-rates from ... 169, 170
distribution of by counties ... 170
duration in days of sickness from ... 178, 179
fatality from ... 169
in cities, villages and townships ... 171
in each month of the year ... 169, 171
in 1899 compared with previous years ... 168
in Michigan in 1899 ... 168–180
number and per cent of newspaper and other reports of ... xxv, 108
number of localities at which present each week in 1899, Table 1 ... 106
outbreaks of, traced to previous outbreaks ... 172
per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 ... 71, 73, 180
per cent of reports stating presence of in 1889-99 and periods of years, Exihibit I ... 63–65
per cent of weekly card reports stating presence of ... 180
period of incubation ... 176
proportion of, in months of year 1899 ... 179, 180
sickness-rates from ... 168, 169, 170
source of contagium of ... 172
two lines of evidence of prevalence of ... 179, 180
Meat poisoning in Michigan in 1899 ... 248
Medical practitioners, return of names, discontinued ... xiv
Meetings of State Board of Health, publication of proceedings of ... xix, xx
regular and special ... xi
Membranous croup (indexed croup).
Meningitis, article on the causation, prevention and restriction of, by Henry B. Baker, M. D. ... 241, 242
as a cause of sickness illustrated by a diagram ... 101
as a comparative cause of sickness ... 86, 90, 91
average age of decedents ... 230
cases which began and were present in each month, 1899 ... 227, 228
deaths per month, and atmospheric temperature for certain years, Tables, 11, 12, 13, Diagrams ... 236–240
definition of disease ... 241
duration of sickness from ... 233, 234
extracts from papers on, by Henry B. Baker, M. D., Secretary of State Board of Health ... 233–242
four sorts, by sex and in age-groups, numbers of cases and deaths, Tables 6 and 7 ... 228–229
four sorts, cause or source of contagium of ... 230–233
four sorts, distribution of, by counties ... 223–226
four sorts, numbers of cases and deaths, and number of localities from which reported, Table 1 ... 220
four sorts reported to State Board of Health office ... 221
four sorts, sickness and death-rates from ... 223–226
how spread, and how avoided ... 241, 242
in Michigan in 1899 ... 220–242
number and per cent of newspaper and other reports of ... xxv, 108
number of deaths by months and average temperature in 1873, Table 10 ... 235
number of deaths per 10,000 population, by months for certain years, and average temperature at Agricultural College ... 227
number of deaths per 100,000 population for years, 1869-96, 1898, 1899, Table 2 ... 221, 222

Page.

- Meningitis, per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
  - per cent of reports stating presence of, 1889-99 and periods of years, Exhibit I 63–65
  - relation of pneumococcus to 232
  - routes by which the disease enters the body 222, 223
  - seasonal prevalence and causation of 229–230
  - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
- Meteorology and sickness in 1900 compared with 1899 .... xxvi, xxvii
- Meteorological characteristics in Michigan in 1899 4–5
- Meteorological conditions and cold weather diseases 93–98, 99–101, 103
    - diagrams relating to 42
    - in 1899 compared with previous years 5, 6, 92
    - in Michigan in 1899 1–57
  - observations in Michigan compiled 1–57
  - observers, names, and locations, Exhibit 1 2
  - phenomena, at several stations 7–9
  - reports .... xiv, xv
  - stations, conditions at 3–57
- Michigan volunteers, typhoid fever among, in 1898 167
- Milk inspection, and tuberculin testing of dairy cows 245, 246
- Mitchell, M. D., D. W., meteorological observer at Harrisville 2

- **Neuralgia,** as a cause of sickness illustrated by a diagram 97
  - as a comparative cause of sickness 86, 89, 90, 91
  - compared with certain meteorological conditions 93–98, 102
  - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
  - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
  - summary of weekly reports, prevalence as regards time and area, Tables 2 and 4 74–85
- Nuisances, action of State Board of Health in regard to 254–255
  - alleged, in Michigan in 1899 254–255

- **Observers,** meteorological, names and localities 2
  - of sickness, names and locations 66–69
- Outbreak, definition of term 107, 144
- Ozone, day, at groups of stations for 1899, 1898 and 1877-98, compared, Exhibit 22 .. 38
  - day, in 1899, at each of, and average for certain stations, Table VIII, Diagram VIII 34–35
  - night, at groups of stations for 1899, 1898 and 1877-98, compared, Exhibit 23 .. 38
  - night, in 1899, at each of, and average for certain stations, Table IX, Diagram IX 36–37

- **Pamphlets** and other publications of office of State Board of Health .... xviii, xix
- Parkville, meteorological phenomena at 7, 8
- Patrick, H. R., meteorological observer at Marquette 2
- Pettyjohn, M. D., E. S., meteorological observer at Alma 2
- Plans for State buildings examined .... ix–xi
- Pleuritis as a cause of sickness compared with meteorological conditions 102
  - as a cause of sickness, illustrated by a diagram 98
  - as a comparative cause of sickness 86, 90, 91
  - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
  - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
  - summary of weekly reports, prevalence of as regards time and aréa, Tables 2 and 4 74–85
- Pneumococcus, in relation to meningitis 232
- Pneumonia and other cold weather diseases compared with meteorological conditions 93, 96, 102
  - as a cause of sickness, illustrated by a diagram 90
  - as a comparative cause of sickness 86, 90, 91
  - in Michigan in 1899 219
  - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
  - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
  - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
- Physicians should have compensation for weekly reports of sickness 59
- Poisoning by cascarets 249, 250
  - by meat in Marcelius 248
- Pontiac, special meeting of State Board of Health at xi
- Port Huron, meteorological conditions at, 1899 3–57
    - latitude, longitude, altitude, atmospheric pressure, at 3
    - ozone 34, 36
    - rainfall 32, 33
    - sunshine and clouds 57
    - temperature 16–18

Page.

- Port Huron, meteorological conditions at, 1899, wind, velocity, direction, etc. 42–43
    - meteorological observer at, 1899 2
    - meteorological phenomena at 9
- Property of State Board of Health, secretary's report for fiscal year 1900 xx–xxii
- Puerperal fever as a cause of sickness illustrated by a diagram 97
    - as a comparative cause of sickness 86, 90
    - in Michigan in 1899 243
    - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
    - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
    - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85

- **Rabies** (hydrophobia) in Michigan in 1899 247
- Rainfall at groups of stations in 1899, 1898 and 1877-98, compared, Exhibit 21 31
    - average number of inches by months in 1899 and periods of years 165
    - average total for 1899 and periods of years, and typhoid fever 166
    - by year and months for 1899 and average line, Table VII, Diagram VII 32, 33
- Ranney, M. D., Geo. E., report of State investigation of outbreak of smallpox in Maple Grove township by 197
    - report of investigation of outbreak of smallpox in Benton Harbor 192, 193
- Redford township, smallpox in 198
- Remittent fever as a cause of sickness, illustrated by a diagram 101
    - as a comparative cause of sickness 86, 90, 91
    - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
    - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
    - relation of, to meteorological conditions 99, 100, 103
    - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85
- Report, annual, law relative to preparation of vi
    - annual, required by law v, vi
    - secretary's relative to property, etc., fiscal year, 1900 xx–xxii
- Reports, annual, blanks sent to health officers for xiv
    - annual, by clerks of boards of health discontinued xiv
    - card, plan of 59, 60
    - meteorological, statement of work on xiv, xv
    - newspaper, relative to contagious diseases, Table 2 108
    - number of in regard to communicable diseases xxiv, xxv
    - of communicable diseases, number received, filed, etc., in 1899 107–109
    - quarterly, abstract of work in office, 1899, from 107–109
    - quarterly, abstracts of work in office of secretary xxiv–xxvii
    - secretary's quarterly, of work in office xx
    - special, relative to dangerous communicable diseases xiii, xiv
    - weekly, annual compilation of 61
    - weekly, of diseases, indicating prevalence of as regards time and area, Tables 2 and 4 74–85
    - weekly, of sickness in Michigan, Diagrams 1, 2, 3, 4, 5 70, 87, 97, 98, 101
    - weekly, of sickness, statistics based on 58–104
- Reprints xvii
- Rheumatism as a cause of sickness, illustrated by a diagram 97
    - as a comparative cause of sickness 86, 89, 90, 91
    - compared with certain meteorological conditions 93–97, 102
    - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
    - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
    - summary of weekly reports, prevalence as regards time and area, Tables 2 and 4 74–85
- Rockland, meteorological conditions at, 1899 3–57
    - atmospheric pressure 52–54
    - cloudiness 28
    - latitude, longitude, altitude, atmospheric pressure at 3
    - ozone 34, 36
    - sunshine and clouds 57
    - temperature 12, 16–19
    - wind, direction of 46–51
    - meteorological observer at, 1899 2
- Rötheln (German measles) in Michigan in 1899 143

- **Saginaw City,** smallpox in 198
- Sanitary conventions vii, viii
    - information published ephemerally vi
- Sault Ste. Marie, meteorological conditions at, 1899 3–57
    - latitude, longitude, altitude, atmospheric pressure at 3
    - rainfall 32
    - sunshine and clouds 57
    - temperature 16–19
    - wind, velocity, direction, etc 42, 43
    - meteorological observer at, 1899 2
    - meteorological phenomena at 9

Page.
Scarlet fever, ages of greatest prevalence of, and mortality from ... 140, 142
  as a cause of sickness illustrated by a diagram ... 87
  as a comparative cause of sickness ... 86, 87, 90, 91
  and meteorological conditions ... 93, 96, 102
  average age ... 141
  cases prevented and lives saved by isolation and disinfection ... 137–139
  death-rates from ... 125
  distribution of, by counties ... 124
  duration of sickness from ... 141, 142
  fatality from ... 125
  in cities, villages and townships ... 125
  in each month of the year ... 126, 127
  in Michigan in 1899 ... 123–143
  in 1899 compared with previous years ... 123
  movement of contagium ... 127–136
  newspaper reports relative to, Table 2 ... 108
  number and per cent of newspaper and other reports of ... xxxv
  number of localities at which present each week in 1899, Table 1 ... 106
  per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 ... 71–73
  per cent of reports stating presence of, in 1889-99 and periods of years, Exhibit I ... 63–65
  period of incubation ... 140
  sickness-rates from ... 125
  source of contagium, how the disease is spread, etc ... 127
  summary of weekly reports, prevalence of, as regards time and area, Tables 2 and 4 ... 74–85
  vitality of contagium ... 127
School teachers and superintendents, data supplied to ... xix
Secretary's quarterly reports of work in office ... xx
  report relative to property, etc., fiscal year, 1900 ... xx–xxii
Sickness and climatic conditions ... 93–104
  diseases which caused most, order of prevalence ... 70–101
  physicians should have compensation for reporting ... 59
  prevalence of, by months, illustrated by diagrams ... 70, 87, 97, 98, 101
  statistical study of, in Michigan ... 58–104
  statistics, work in connection with ... xxvi
  total, and average disease ... 101, 104
Smallpox, ages of greatest prevalence of, and mortality from ... 192
  as a cause of sickness illustrated by a diagram ... 87
  as a comparative cause of sickness ... 86, 89, 91
  distribution of by counties in 1899 ... 190
  in Battle Creek city ... 194
  in Benton Harbor city ... 192, 193
  in Benton township ... 193
  in Brant township ... 195, 196
  in Carrollton township ... 196
  in Chase township ... 195
  in Chesaning township ... 196
  in Coloma village ... 193
  in Delray village ... 198
  in Detroit ... 198, 199
  in Grand Rapids city ... 195
  in Kalamazoo city and township ... 195
  in Maple Grove township, State investigation of ... 196, 197
  in Marine City ... 198
  in Masonville township ... 194, 195
  in Redford township ... 198
  in Saginaw city ... 198
  in St. Joseph city ... 193, 194
  in Watervliet township and village ... 194
  interstate notifications of ... 199
  newspaper reports relative to, Table 2 ... 108
  number and per cent of newspaper and other reports of ... xxv
  number of localities at which present each week in 1899, Table 1 ... 106
  outbreaks of, in each month of the year 1899 ... 190, 191
  per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 ... 71–73
  per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I ... 63–65
  source of contagium of ... 191
  success of efforts for the restriction of ... 190
  summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 ... 74–85
  (variola) in Michigan in 1899 ... 190–199
State Board of Health (indexed, Board of Health, State).
State buildings, examination of plans for, and list of ... ix–xi
State, geographical divisions, names of observers reporting sickness from, Exhibit II ... 66–69
St. Joseph city, smallpox in ... 193, 194
Sunshine and clouds in Michigan in 1899 ... 57

Page.
Table I, average temperature by year and months, 1899, at each of, and average for certain stations in Michigan ... 12
II, extremes and range of temperature, by months, for 1899, at stations in Michigan ... 16–17
III, average daily range of temperature, by year and months, 1899, at each of, and average for certain stations in Michigan ... 18
IV, absolute humidity at each of 10, and average line for 7 stations in Michigan, in 1899 ... 22
V, relative humidity at each of 11, and average line for 8 stations in Michigan, in 1898 ... 24
VI, average per cent of cloudiness, by months, at each of 12 and average for 10 stations in Michigan, in 1899 ... 28
VII, rainfall by year and months, 1899, at each of, and average for 15 stations in Michigan ... 32
VIII, ozone, day, by months, in 1899, at each of 13, and average lines at 9 and at 2 stations in Michigan ... 34
IX, ozone, night, by months, in 1899, at each of 13, and average lines at 9 and at 2 stations in Michigan ... 36
X, average velocity of wind, each hour of day, for 1899, at State Board of Health office, Lansing ... 40
XI, velocity of wind, miles per hour, by months, 1899, at each of, and average for 8 stations in Michigan ... 42
XII, wind, direction, by months, average for 9 stations in Michigan, in 1899 ... 45
XIII, wind, direction of, by months, 1899, at each of and average for 9 stations ... 46
XIV, wind, direction of, by months, 1899, at each of 11, and average line at 9 stations in Michigan ... 47–50
XV, average daily range of atmospheric pressure, by months at each of 10 and average for 8 stations in Michigan ... 52
XVI, range of atmospheric pressure at, by months for 1899, at each of and average for 8 stations in Michigan ... 53
XVII, average atmospheric pressure, by months, in 1899, at 11 and average line for 9 stations in Michigan ... 54
1, consumption, localities, cases and deaths, 1893-99 ... 201
2, consumption, deaths reported from, in each of years 1869-96 ... 202
3, consumption, cases and deaths from, in counties ... 204
4, consumption, number of deaths by months in 1899, and average for period of years ... 206
5, consumption, number and per cent of cases in certain age-groups ... 207
6, consumption, by sex and age-groups, the number of deaths from ... 208
7, consumption, by sex, the per cent of deaths from, in age-groups ... 208
8, consumption, duration of fatal cases of, by sex ... 209
9, consumption, duration of sickness of non-fatal cases of ... 209
1, diphtheria, distribution of sickness from, by counties ... 111
2, diphtheria, in cities, villages and townships ... 112
3, outbreaks of diphtheria which began, ended and were present by months in 1899 ... 113
4, diphtheria, cases taken sick and present in localities by months, in 1899 ... 113
5, diphtheria, number of cases and lives saved from, by isolation and disinfection ... 116
6, diphtheria, cases and deaths in outbreaks of, where isolation and disinfection were enforced, neglected, doubtful, etc ... 117
7, diphtheria, period of incubation ... 118
8, diphtheria, number and per cent of cases in certain age-groups ... 118
9, diphtheria, per cent of cases and deaths in certain age-groups ... 119
10, diphtheria, cases by sex in age-groups ... 119
11, diphtheria, deaths by sex in age-groups ... 120
12, diphtheria, duration of fatal cases of, by sex ... 120
13, diphtheria, duration of non-fatal cases of, by sex ... 121
1, gasoline casualties in Michigan, and in Detroit, in 1899 ... 253
1, kerosene casualties in Michigan, and in Detroit, in 1899 ... 250
2, kerosene casualties in 1899 compared with previous years ... 251
3, kerosene casualties in Detroit during each of years, 1889-99 ... 252
1, measles, localities, outbreaks, cases and deaths, in 1899 and average for period of years ... 168
2, measles, cases and deaths from, in each county in Michigan ... 170
3, measles, cases and deaths from, in cities, villages and townships in 1899 ... 171
4, measles, outbreaks of which began, ended and were present, by months in 1899 ... 171
5, measles, number and per cent of cases taken sick, and present and localities infected, by months ... 171
6, measles, cases and deaths in outbreaks where isolation and disinfection were doubtful, enforced, neglected, etc ... 174
7, measles, cases prevented and lives saved by isolation and disinfection ... 175
8, measles, period of incubation of ... 176
9, measles, number of cases and deaths in certain age-groups ... 176
10, measles, per cent of cases and deaths from, in certain age-groups ... 177
11, measles, non-fatal cases by sex in age-groups ... 177
12, measles, fatal cases by sex and age-groups ... 178
13, measles, total number for 10 years, 1890-99, by age-groups, and per cent the deaths in each age-group were of all cases in that group ... 178
14, measles, duration of sickness, by sex of fatal cases ... 178
15, measles, duration of sickness of non-fatal cases of, by sex ... 179
16, measles, the proportionate number of cases by months in 1899 ... 180

Page.
Table 1, meningitis, four sorts; localities, cases, deaths, cases and deaths per locality, case-mortality 220
2, meningitis, deaths per 100,000 population, from meningitis and tubercular meningitis, 1869-96, 1898, 1899.......... 221
3, meningitis, four sorts; cases, deaths, case and death-rates by counties.... 224-226
4, meningitis, death-rates by months, and average temperature, 1872, 1873, 1898, 1899 227
5, meningitis, number of cases which began and were present each month, 1899 227
6, meningitis, four sorts; by sex, number and per cent of cases in each age-group 228
7, meningitis, four sorts; by sex, number and per cent of deaths in each age-group 229
8, meningitis, four sorts; reported cause, origin, or source of contagium...... 231
9, meningitis, four sorts: by sex, the duration in days and periods of days of sickness 234
10, meningitis, deaths from cerebro-spinal and spinal meningitis, spotted fever and spinal fever, and average temperature, by months, 1873.......... 235
11, meningitis, by months, total deaths and average temperature, 1877-96.... 236
12, meningitis, number of deaths from cerebro-spinal meningitis, and average temperature, by months, 1898.......... 236
13, meningitis, number of deaths from cerebro-spinal meningitis, and average temperature, by months, 1899.......... 236
1, scarlet fever, distribution of by counties.......... 124
2, scarlet fever, distribution of, in cities, villages and townships.......... 125
3, scarlet fever, outbreaks which began, ended and were present by months.. 126
4, scarlet fever, number and per cent of cases taken sick, cases present and localities infected by months.......... 126
5, scarlet fever, restriction of, by measures of isolation and disinfection in 1899 138
6, scarlet fever, cases and deaths where isolation and disinfection were enforced, neglected, and doubtful, and cases prevented and lives saved for years, 1887-99 139
7, scarlet fever, period of incubation.......... 140
8, scarlet fever, number of cases and deaths by age-groups, per cent cases in each group were of all cases, etc.......... 140
9, scarlet fever, per cent of cases and deaths by age-groups in 1899 and 1893-98 141
10, scarlet fever, by sex and age-groups, number and per cent of deaths, and average age, for 1899 and 1893-98.......... 141
11, scarlet fever, by sex and age-groups, the per cent of non-fatal cases and average age for 1899 and 1893-98.......... 142
12, scarlet fever, by sex, the duration in days of sickness of fatal cases for 1899 and 1893-98.......... 142
13, scarlet fever, by sex, the duration in days of sickness of non-fatal cases, for 1899 and 1893-98.......... 142
1, smallpox, distribution of, by counties in 1899.......... 190
2, smallpox, outbreaks which began, ended and were present by months in 1899 190
3, smallpox, number of cases present in any month of 1899.......... 191
4, smallpox, cases and deaths from, by age-groups.......... 191
1, typhoid fever, in 1899 compared with averages for years, 1886-98........ 144
2, typhoid fever, distribution of, by counties.......... 145
3, typhoid fever, outbreaks which began, ended and were present by months of 1899 146
4, typhoid fever, number and per cent of cases sick, by months in 1899...... 147
5, typhoid fever, movement of contagium from one locality to another....... 149-158
6, typhoid fever, cases and deaths per restricted and neglected outbreaks.... 159
7, typhoid fever, cases prevented and lives saved by isolation and disinfection in years, 1890-99.......... 160
8, typhoid fever, by sex, the duration of fatal cases, for years 1887-99...... 162
9, typhoid fever, by sex, the duration in days of non-fatal cases for years, 1887-99 162
10, typhoid fever, by sex, the per cent of sickness by age-groups and average age for years 1887-99.......... 162
11, typhoid fever, by sex, the per cent of fatal cases in age-groups for years 1892-99 163
12, typhoid fever, by sex and age-groups the number of deaths, and death-rates, for years 1892-99.......... 164
13, typhoid fever, per cent of reports stating presence of, numbers of outbreaks, cases and deaths for 1899 and averages for years 1886-98.......... 164
14, height of ground water by months for 1899, and average for years, 1886-98, at Lansing 165
15, typhoid fever, per cent of cases, per cent of outbreaks which began, and height of ground water, by months.......... 160
16, typhoid fever, presence of, by months, for 1899, and averages for two periods of years 165
17, average number of inches of rainfall, by months for 1899, and years 1878-87 and 1886-98 165
18, temperature of water in well at Lansing by months for 1899, and averages for years 1886-98 166
19, typhoid fever, sickness from and depth and temperature of water in well at Lansing 166

Page.
Table 20. rainfall and depth of ground water at Lansing and in State. in 1899 and 1886-98. and typhoid fever ... 166
1. whooping-cough. localities. cases. deaths. sickness and death-rates. 1899. compared with averages. 1887-98 ... 181
2. whooping-cough. cases and deaths. sickness and death-rates by counties ... 182
3. whooping-cough. number of outbreaks present in each month, 1899 ... 183
4. whooping-cough. source of contagium of cases of ... 184
5. whooping-cough. outbreaks. cases and deaths. isolation and disinfection enforced. neglected. doubtful. etc ... 186
6. whooping-cough. period of incubation in days of cases of ... 187
7. whooping-cough. in age-groups. number of cases and deaths. per cent cases in each group were of all cases. per cent deaths in each group were of all deaths. and case-mortality ... 187
8. whooping-cough. by sex. in age-groups. the per cent of non-fatal cases of ... 188
9. whooping-cough. by sex. in age-groups. the per cent of fatal cases ... 188
10. whooping-cough. by sex. the duration of sickness in periods of days of fatal cases ... 189
11. whooping-cough. by sex. the duration of sickness in periods of days of non-fatal cases ... 189
1, number and per cent of reports from newspapers and other sources in regard to certain diseases ... xxv
1. number of places at which communicable diseases were present in 1899 ... 106
2. newspaper reports stating presence of communicable diseases ... 108
1. per cent of observers reporting presence of each of the 28 diseases in 1889-1899. and average for 1877-98. and 1889-1898 ... 71-73
2. weekly reports of diseases indicating prevalence as regards time and area. 74-83
4. summary of prevalence of diseases. by State divisions ... 84, 85
Tecumseh. meteorological conditions at, 1899 ... 3-57
atmospheric pressure ... 52-55
cloudiness ... 28, 29
humidity ... 22-25
latitude. longitude. altitude, atmospheric pressure at ... 3
ozone ... 34-37
rainfall ... 32, 33
temperature ... 12, 13, 16-18
wind. direction of ... 46-51
meteorological observer at. 1899 ... 2
Tefft. C. C.. meteorological observer at Tecumseh ... 2
Telegraph, instructions to health officials by ... xvii
Telephone. instructions to health officials by ... xvii
Temperature. average and average line at several stations. Table 1. Diagram I ... 12, 13
average. at meteorological stations in Michigan. Exhibit 2 ... 3
average. by year and months. for certain years at Agricultural College, Exhibit 5 ... 4
average, by year and months. for certain years at State Board of Health office. Exhibit 4 ... 4
average. comparative observations by different thermometers at office of State Board of Health. Exhibit 11 ... 15
average daily range at stations in Michigan. Table III. Diagram II ... 18, 19
average daily range. 1898. 1899. and periods of years for groups of stations. compared. Exhibit 12 ... 15
average for 1898. 1899 and groups of years compared. Exhibit 8 ... 11
average. for 1899. 1898 and period of years. at Agricultural College, compared. Exhibit 9 ... 14
average. for 1899. 1898 and period of years. at office of State Board of Health. compared, Exhibit 10 ... 14
average. for groups of meteorological stations. Exhibit 3 ... 4
extremes and range at different stations compared, for groups of years, Exhibit 13 ... 20
extremes and range at different stations in Michigan, Table II ... 16, 17
Thornville. meteorological conditions at. 1899 ... 3-57
atmospheric pressure ... 52-55
auroras ... 30
cloudiness ... 28, 29
humidity ... 22-25
latitude, longitude. altitude, atmospheric pressure, at ... 3
ozone ... 34-37
rainfall ... 32, 33
sunshine and clouds ... 57
temperature ... 12, 13, 16-19
wind. direction of ... 46-51
meteorological observer at, 1899 ... 2
meteorological phenomena at ... 7-9
Tonsillitis as a cause of sickness, illustrated by a diagram ... 87
as a comparative cause of sickness ... 86. 89, 90. 91
compared with certain meteorological conditions ... 93-99, 102
per cent of observers reporting presence of. in 1889-99, and periods of years. Table 1 ... 71-73
per cent of reports stating presence of, in 1889-99. and periods of years, Exhibit 1 ... 63-65
summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 ... 74-85

Page.

- Traverse City, meteorological conditions at, 1899 3–57
  - atmospheric pressure 52–55
  - cloudiness 28, 29
  - humidity 22–25
  - latitude, longitude, altitude, atmospheric pressure, at 3
  - ozone 34–37
  - rainfall 32, 33
  - sunshine and clouds 57
  - temperature 12, 13, 16–19
  - water in well, depth, temperature, etc 10
  - wind, direction of 46–51
  - meteorological observer at, 1899 2
  - meteorological phenomena at 8
  - special meeting of State Board of Health at xi
- Tuberculosis (indexed also consumption).
  - a bill to provide for tuberculin testing of dairy cows 245, 246
  - in cattle in Michigan in 1899 244–245
- Typhoid fever in Michigan in 1899 144–167
  - age of occurrence of, and deaths from 161–164
  - and depth and temperature of water in well at Lansing 166
  - and ground water in well at Lansing 160
  - and meteorological conditions 99, 100, 103
  - among Michigan volunteers in 1898 and its relation to typhoid fever in 1898 and 1899 167
  - as a cause of sickness illustrated by a diagram 101
  - as a comparative cause of sickness 86, 89, 90, 91
  - average per cent of card-reports stating presence of 165
  - average total rainfall, and depth and temperature of water in well at Lansing 166
  - believed to be spread by flies 147, 148
  - death-rates from 146
  - distribution by counties 145
  - duration of sickness from 161–162
  - failure to report 166, 167
  - in each month of the year 146, 147
  - in 1899 compared with previous years 144
  - longevity of germ of 148
  - movement of contagium of 149–158
  - newspaper reports relative to, Table 2 108
  - number and per cent of newspaper and other reports of xxv, 108
  - outbreaks, cases and deaths in 1899 144
  - per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1 71–73
  - per cent of reports stating presence of, and numbers of outbreaks, localities, cases and deaths for 1899 and averages for 1886-98 164
  - per cent of reports stating presence of, in 1886-99 and periods of years, Exhibit I 63–65
  - results of restrictive measures 158–161
  - sickness-rates from 146
  - source of contagium of 147, 148
  - summary of weekly reports, prevalence of, as regards time and area, Tables 2 and 4 74–85
  - two lines of evidence of prevalence of 163–165
- Typho-malarial fever as a cause of sickness, illustrated by a diagram 101
  - as a comparative cause of sickness 86, 89, 90, 91
  - per cent of observers reporting presence of, in 1889-99, and periods of years, Table 1 71–73
  - per cent of reports stating presence of, in 1889-99, and periods of years, Exhibit I 63–65
  - relation of, to meteorological conditions 99, 100, 103
  - summary of weekly reports, prevalence of as regards time and area, Tables 2 and 4 74–85

- **Vaccination** 200
- Varicella (chicken-pox) in Michigan in 1899 199
- Variola (indexed smallpox).
- Volunteer troops from Michigan, typhoid fever among 167

- **Wait, S. E.,** meteorological observer at Traverse City 2
- "Warm weather diseases," relation of to meteorological conditions 99–101, 103
- Water, depth, temperature, etc., at several stations, Exhibit 7 10
  - ground, height of, in well at Lansing, by months, in 1899 and averages for 1886-98 165
  - ground, in well at Lansing and typhoid fever 190
  - temperature of, in well at Lansing in 1899 and averages for 1886-98 166
- Watervliet, smallpox in 194
- Weather and health in 1900 compared with 1899 xxvii
- Weather Bureau, U. S., reports of, compiled 1–57
- Wells, Hon. Frank, President of State Board of Health vii
- Wells, depth of, depth and temperature of water at certain stations, Exhibit 7 10

Page.

- Whooping-cough in Michigan in 1899, 181–189
  - ages of greatest prevalence of and mortality from, 187, 188
  - and meteorological conditions, 99, 100, 103
  - as a comparative cause of sickness, 86, 89, 90, 91
  - as a cause of sickness illustrated by a diagram, 97
  - definition of outbreak of, 185
  - distribution of, by counties in 1899, 181–183
  - duration in days of sickness from, 187–189
  - estimated number of outbreaks and cases of, prevented and lives saved by isolation and disinfection, 185, 186
  - in each month of the year, 183
  - in 1899 compared with previous years, 181
  - number and per cent of newspaper and other reports of, xxv, 108
  - number of localities at which present each week in 1899. Table 1, 106
  - numbers of outbreaks of, isolation and disinfection enforced, neglected, etc., 186
  - outbreaks reported traced to previous outbreaks, 183, 184
  - per cent of observers reporting presence of, in 1889-99 and periods of years, Table 1, 71–73
  - per cent of reports stating presence of, in 1886-99 and periods of years, Exhibit I, 63–65
  - period of incubation, 187
  - sickness and death-rates from, 182, 183
  - source of contagium and how the disease is spread, 183, 184
  - summary of weekly reports, prevalence of, as regards time and area, Tables 2 and 4, 74–85
  - transgression of public health laws in regard to, 184, 185
- Wind, average velocity at groups of stations for 1899, 1898 and 1882-98, compared, Exhibit 24, 39
  - average velocity at State Board of Health office for 1899. 1898 and 1880-98, compared, Exhibit 25, 39
  - average velocity per hour at each of and average for certain stations, Table XI, Diagram XI, 42, 43
  - average velocity per hour, by months in 1899. at office of State Board of Health, Exhibit X, Diagram X, 40, 41
  - direction of, Exhibit 26, Diagrams XIII, XIV, XV, XII, Tables XII, XIII, XIV, 44–51
- Work in connection with sickness statistics, xxvii
  - in office of secretary of State Board of Health. 1900, xii–xx

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